Figure 1: Examples of Nuclease Stable Ribozyme Motifs

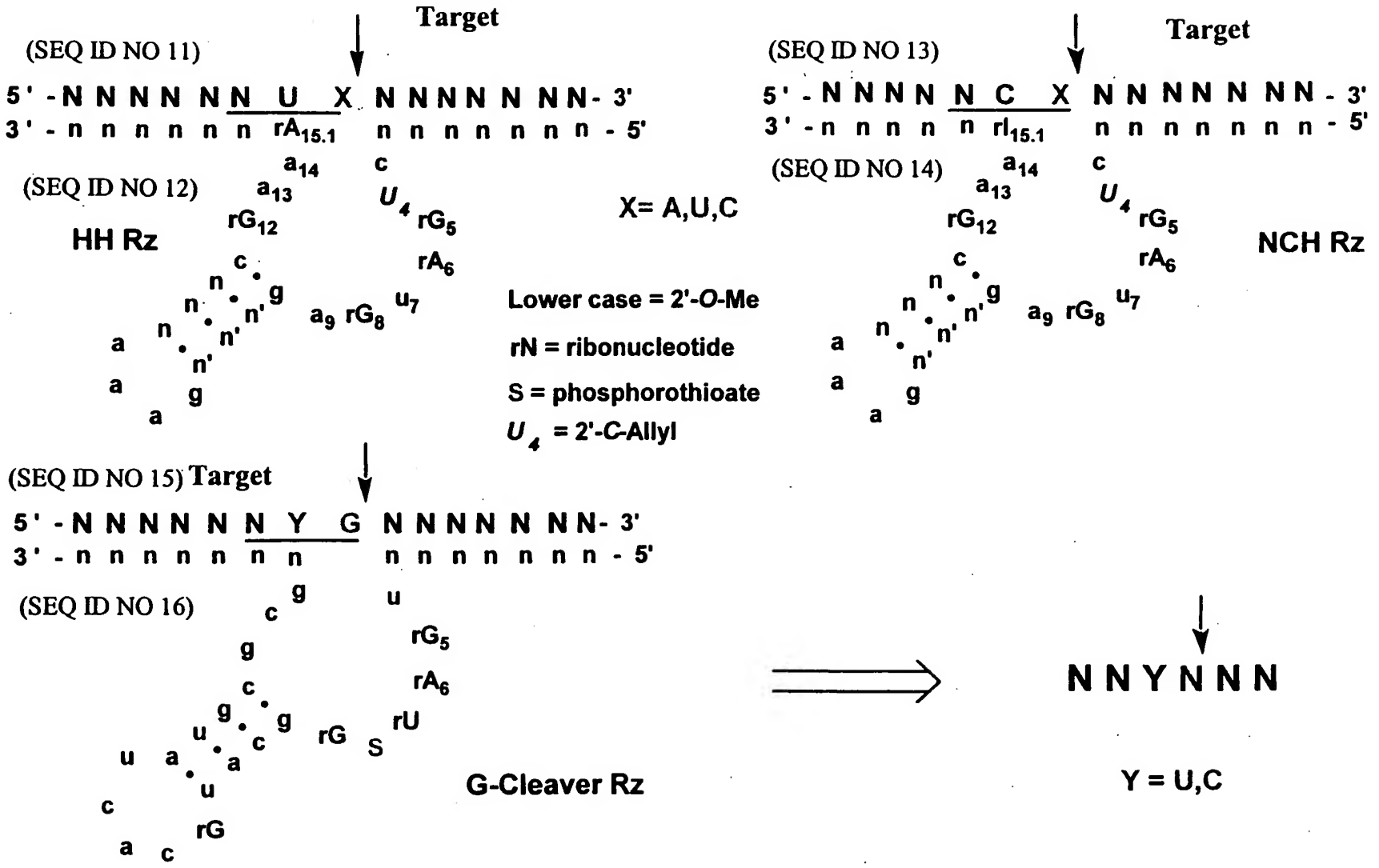


Figure 2: 2'-*O*-Me substituted Amberzyme Enzymatic Nucleic Acid Motif

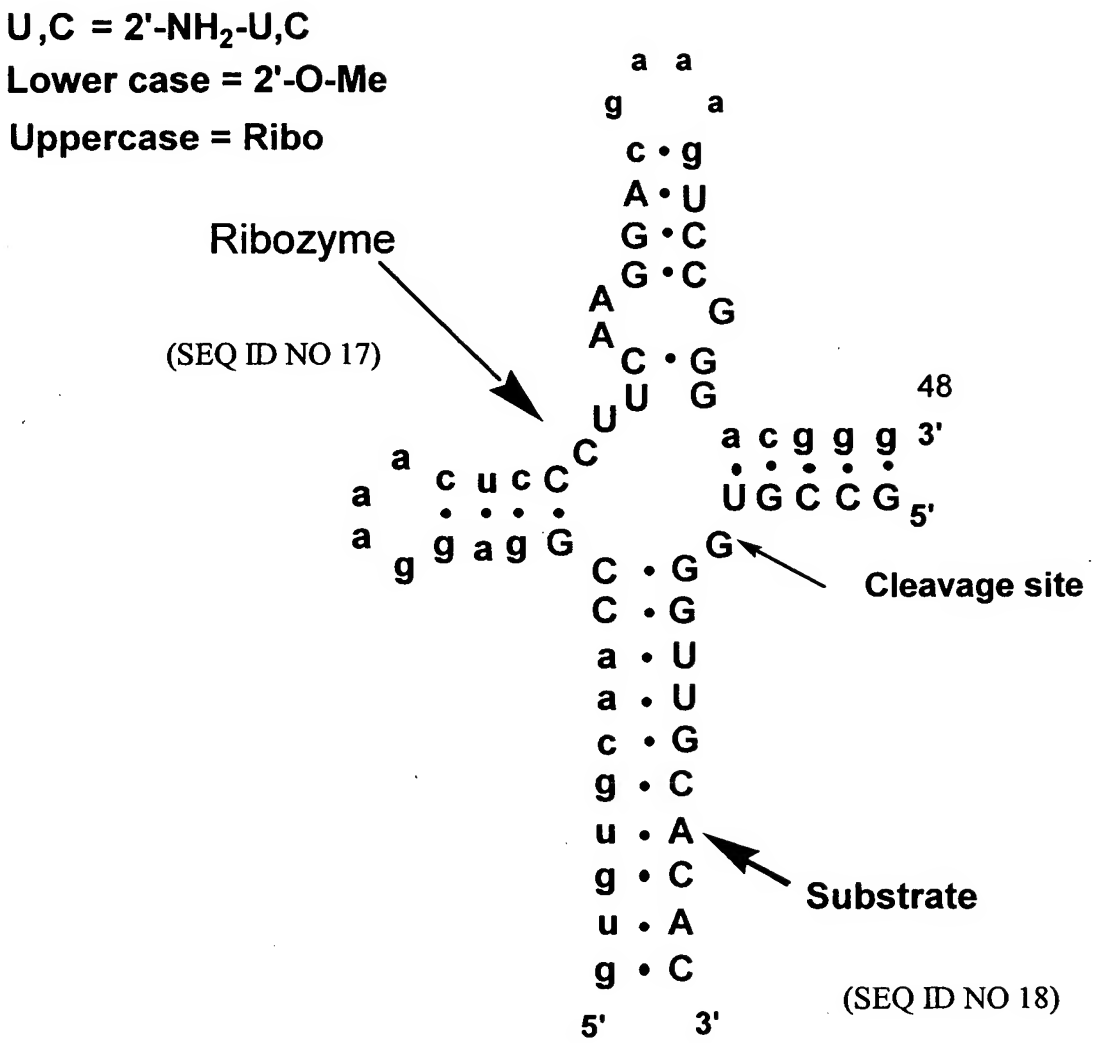
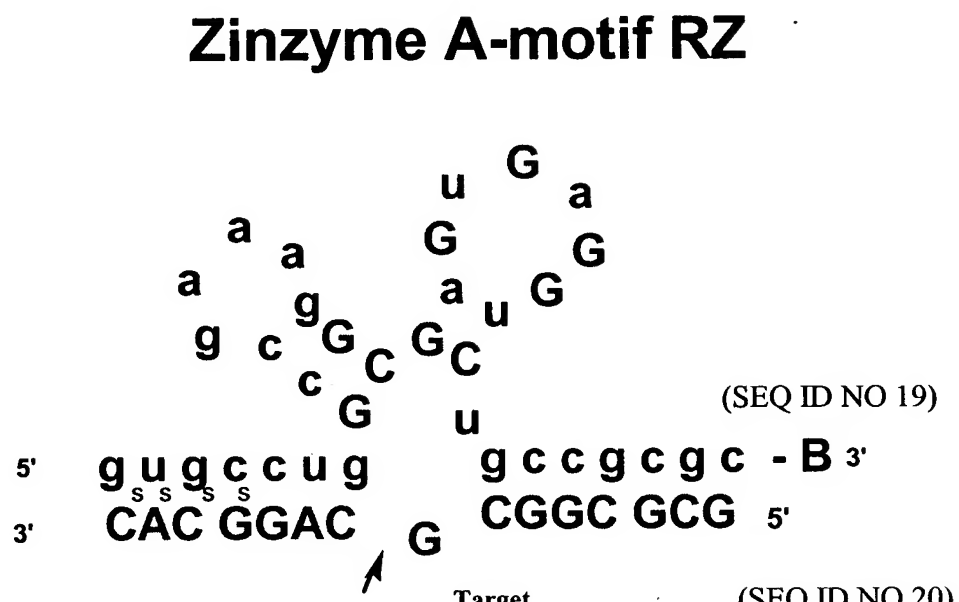


Figure 3: Stabilized Zinzyme Ribozyme Motif



Legend

Uppercase indicates natural ribo residues

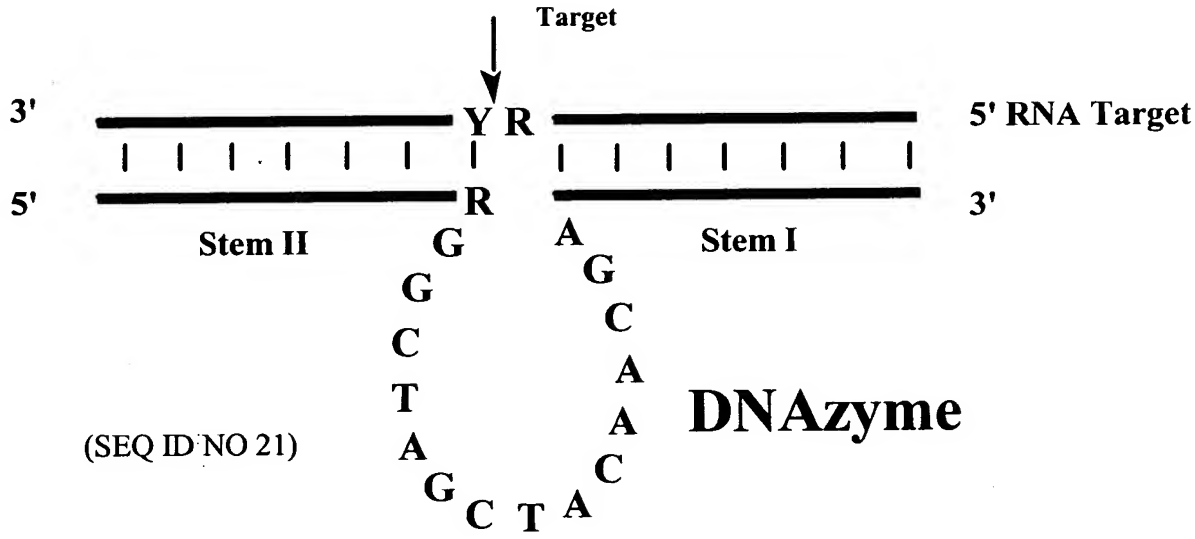
C indicates 2' - d-NH_2-C

Lowercase: 2'-*O*- Me

Subscript $_S$ indicates phosphothioate linkage

B: 3'-3' abasic moiety

Figure 4: DNAzyme Motif



Legend

Y = U or C
R = A or G

Figure 5. Detection of Target Sequence Using a Cis-Blocking Sequence

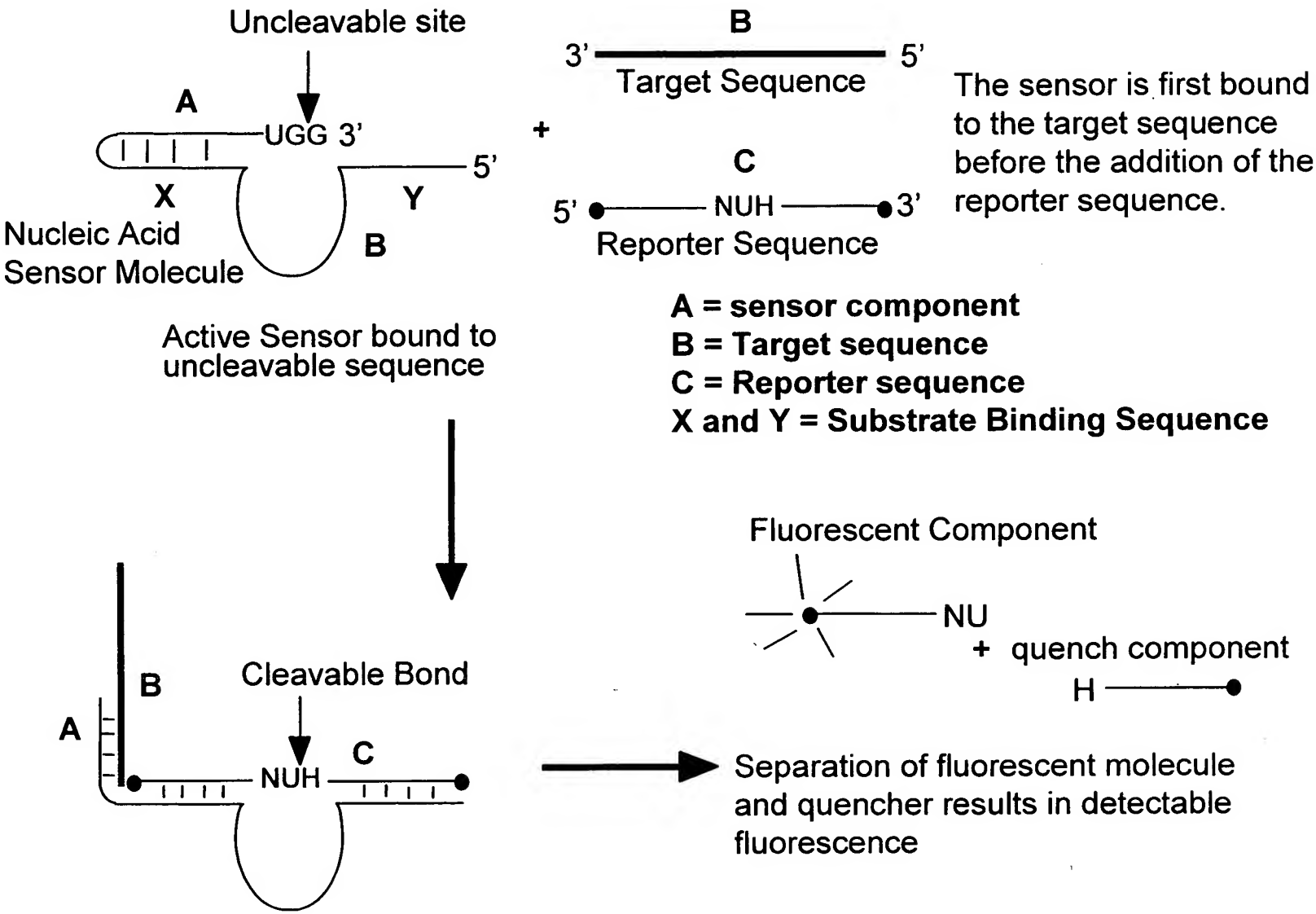
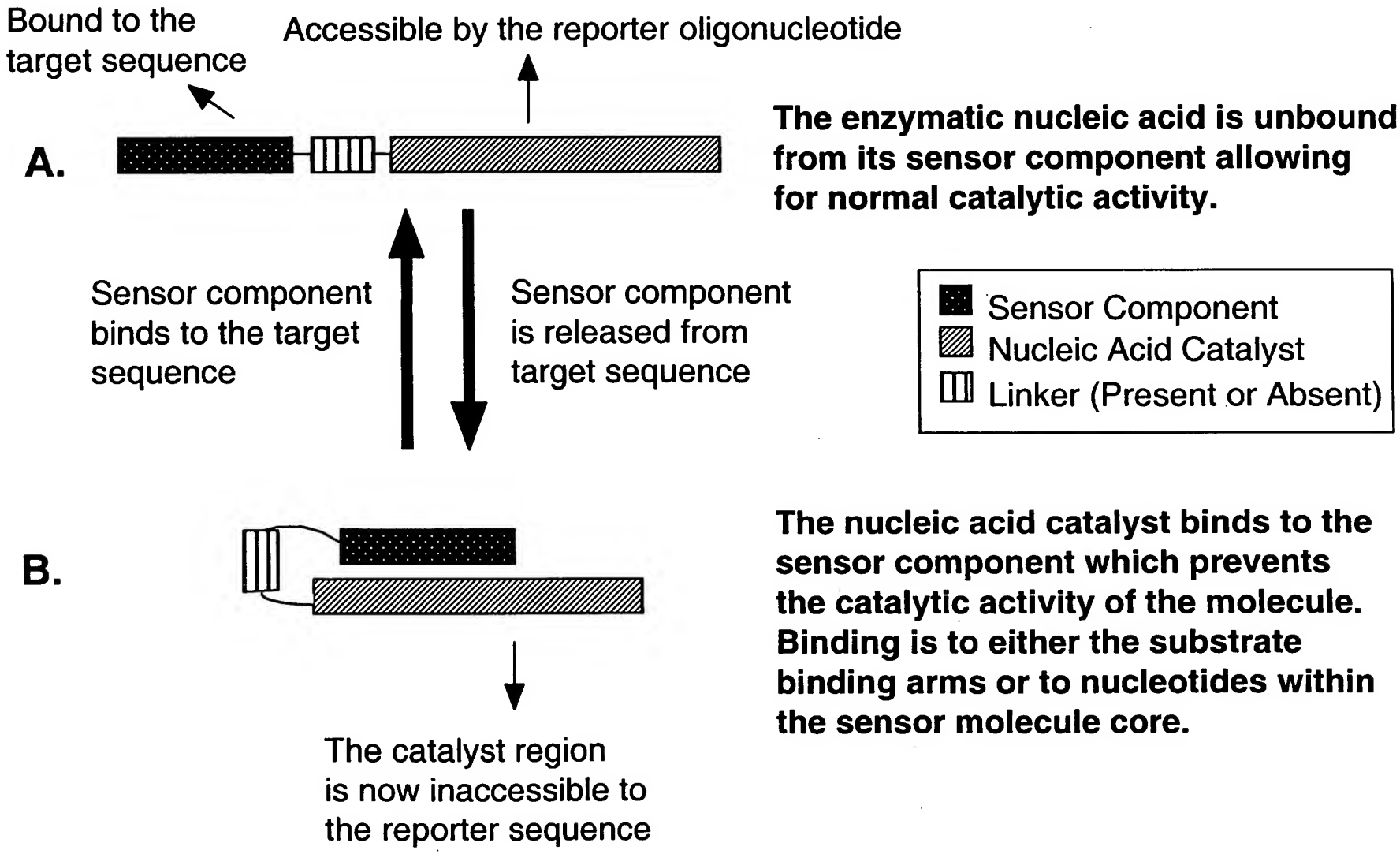


Figure 6. Schematic Diagram Representing the Two Primary Configurations of the Diagnostic effector molecule



The enzymatic nucleic acid is unbound from its sensor component allowing for normal catalytic activity.

The nucleic acid catalyst binds to the sensor component which prevents the catalytic activity of the molecule. Binding is to either the substrate binding arms or to nucleotides within the sensor molecule core.

Figure 7a. Examples of Diagnostic Effector Molecules

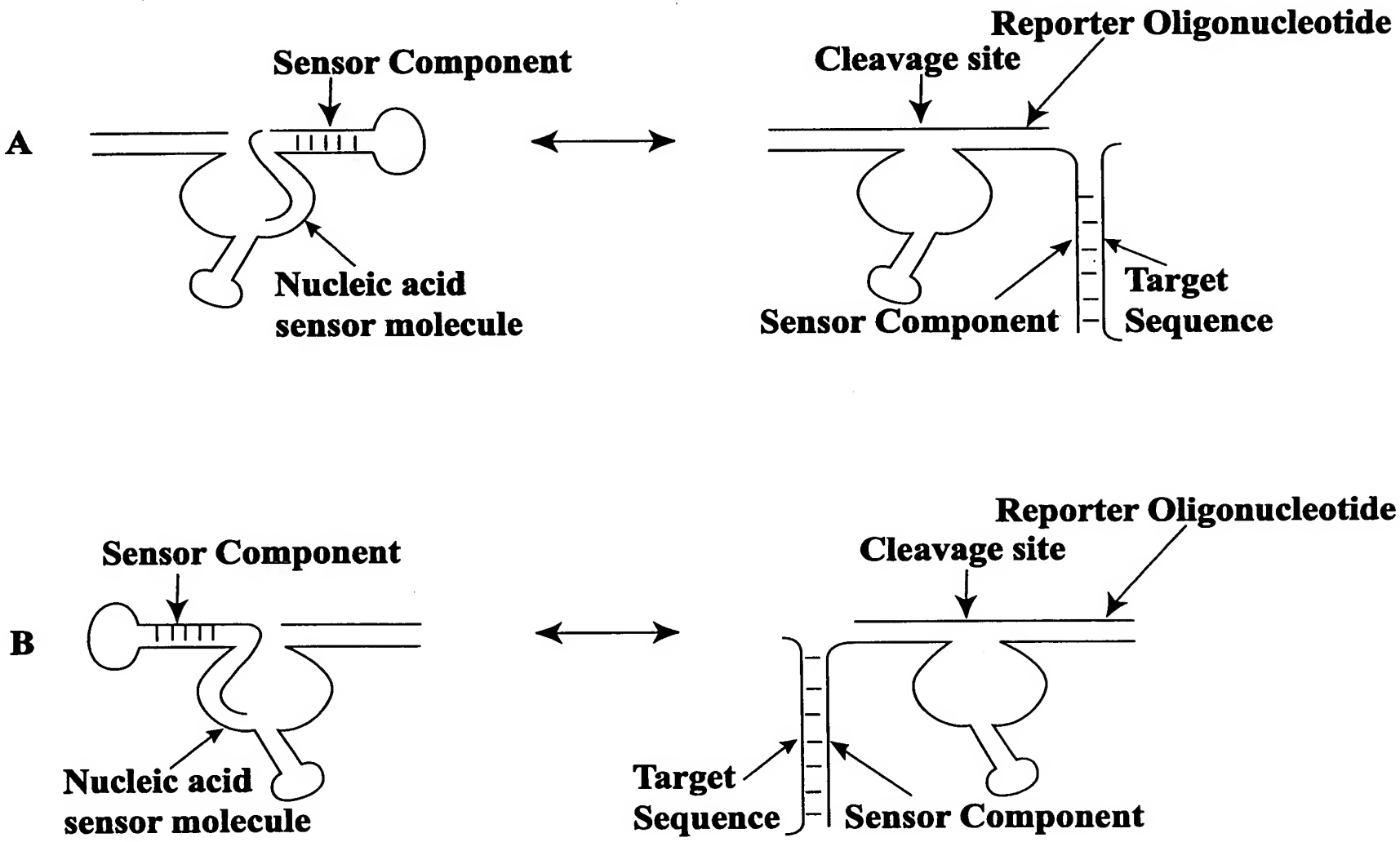


Figure 7b. Examples of Diagnostic Effector Molecules

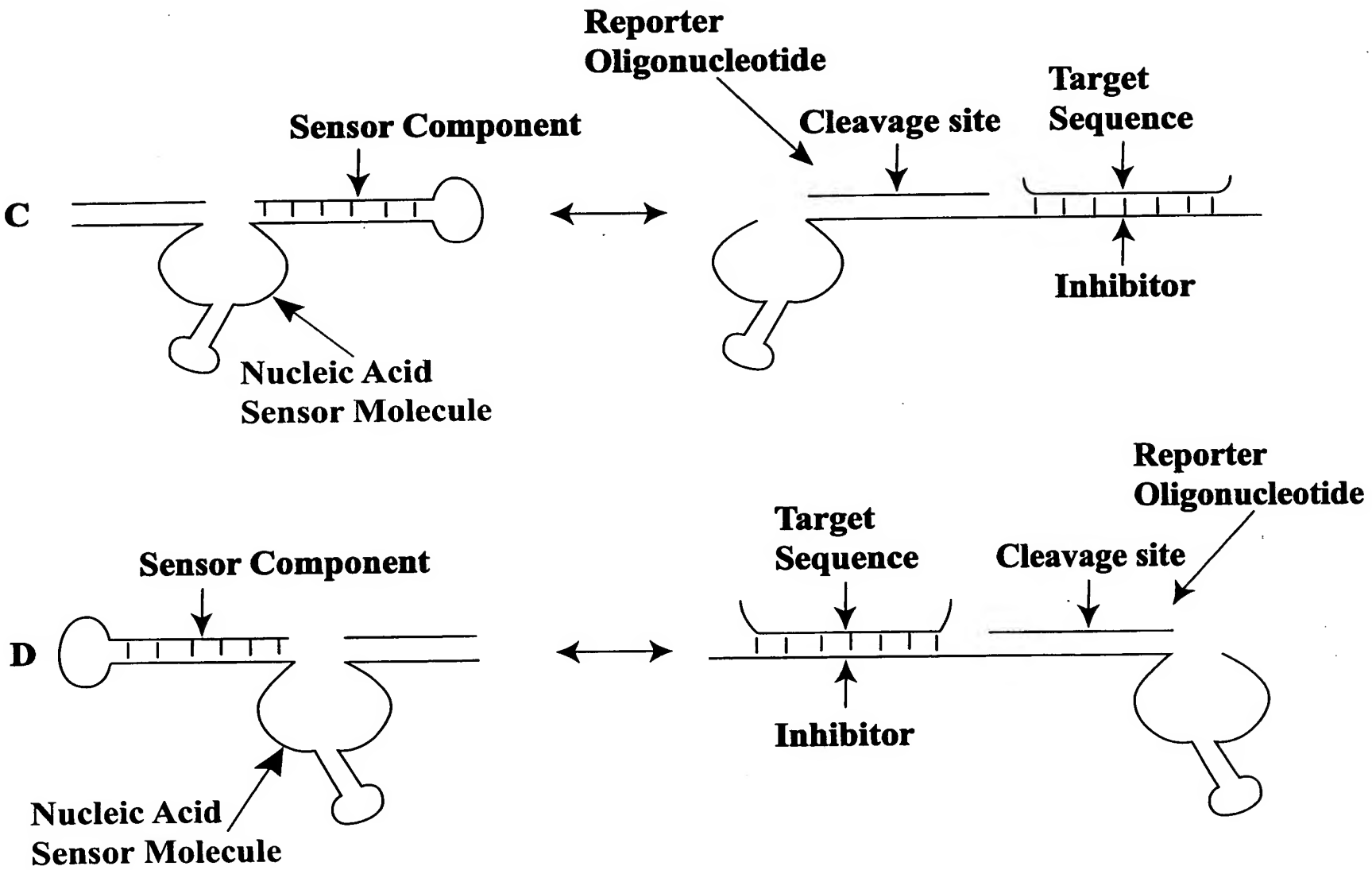
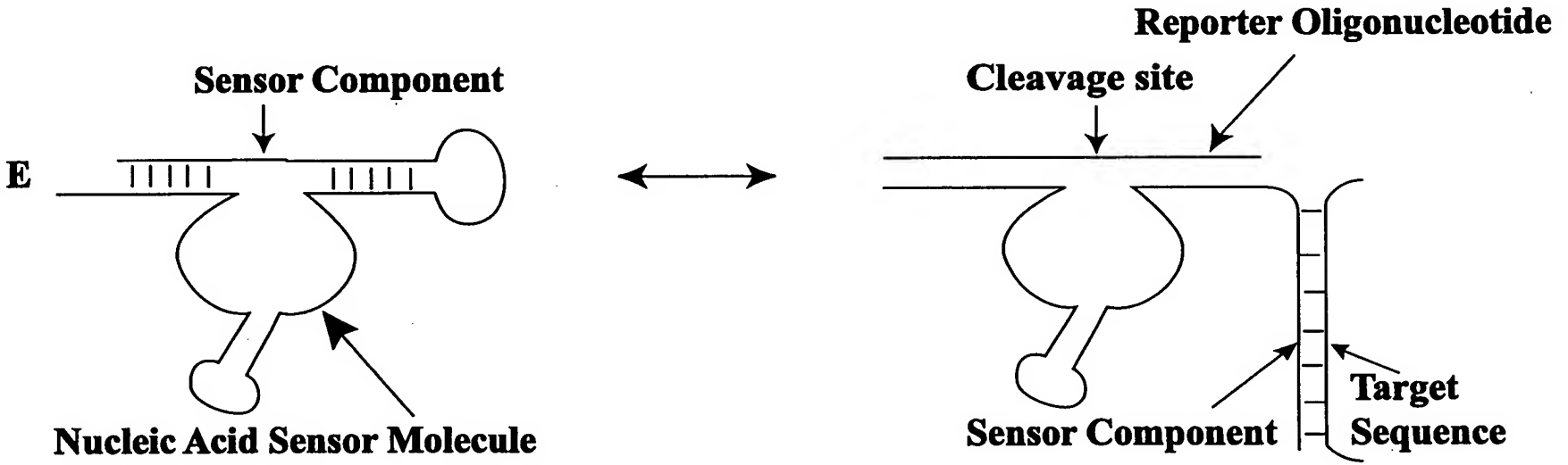


Figure 8a. Examples of Diagnostic Effector Molecules



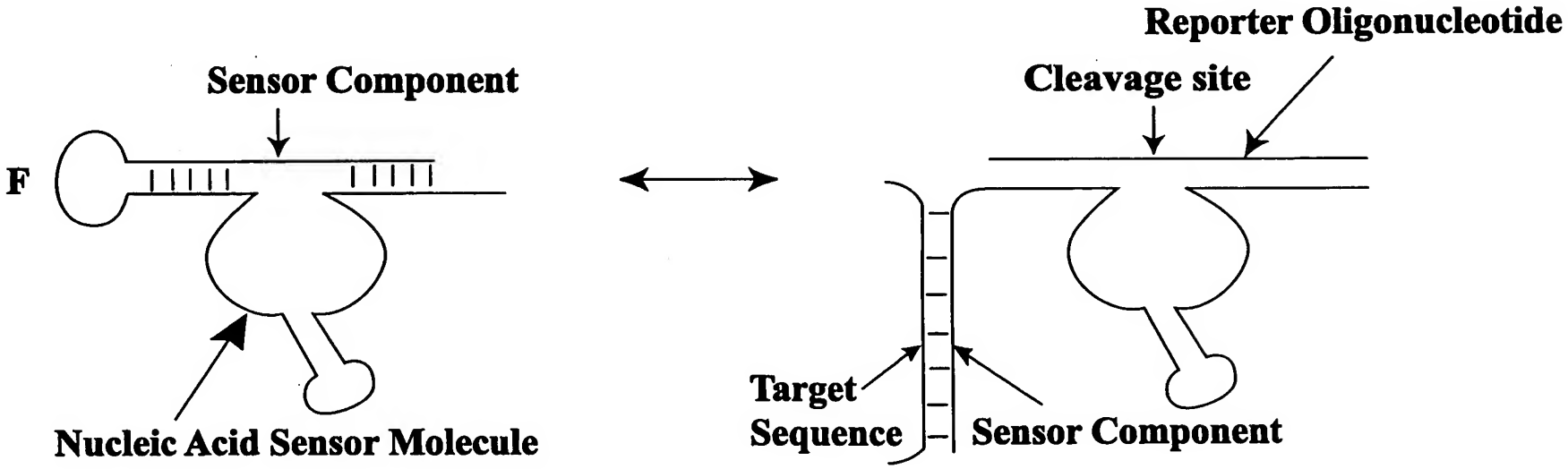


Figure 8b. Examples of Diagnostic Effector Molecules

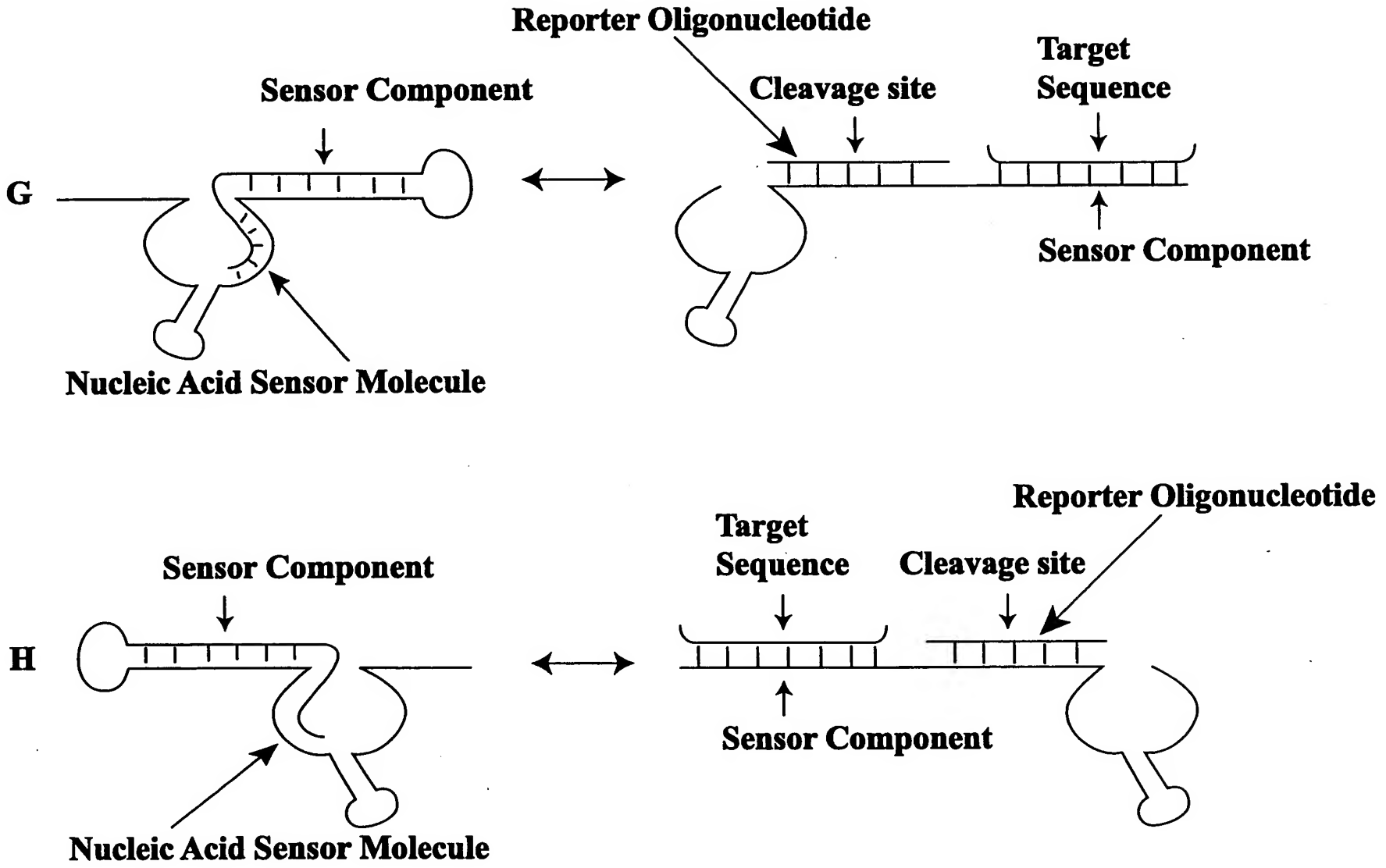


Figure 9. Examples of Diagnostic Effector Molecules

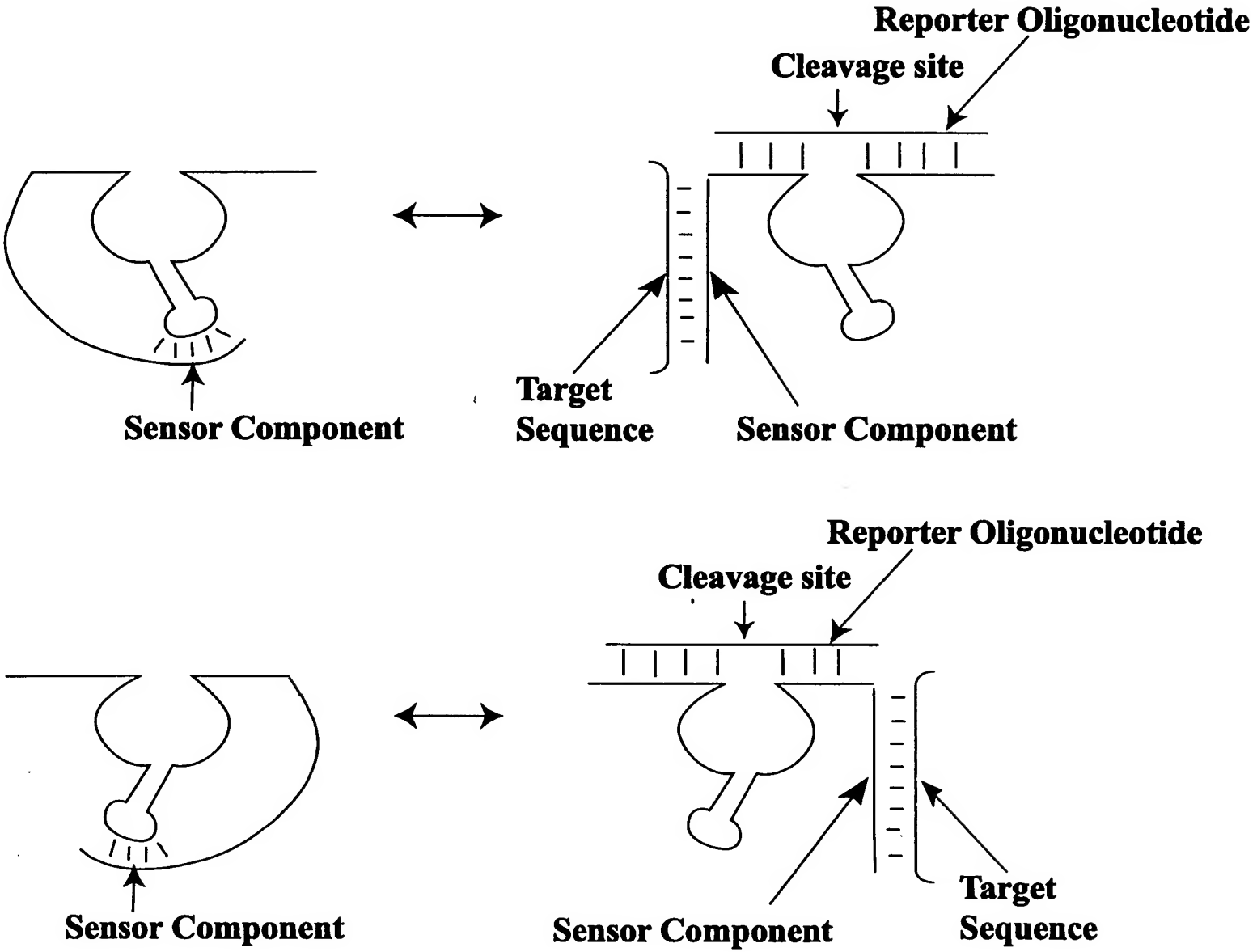
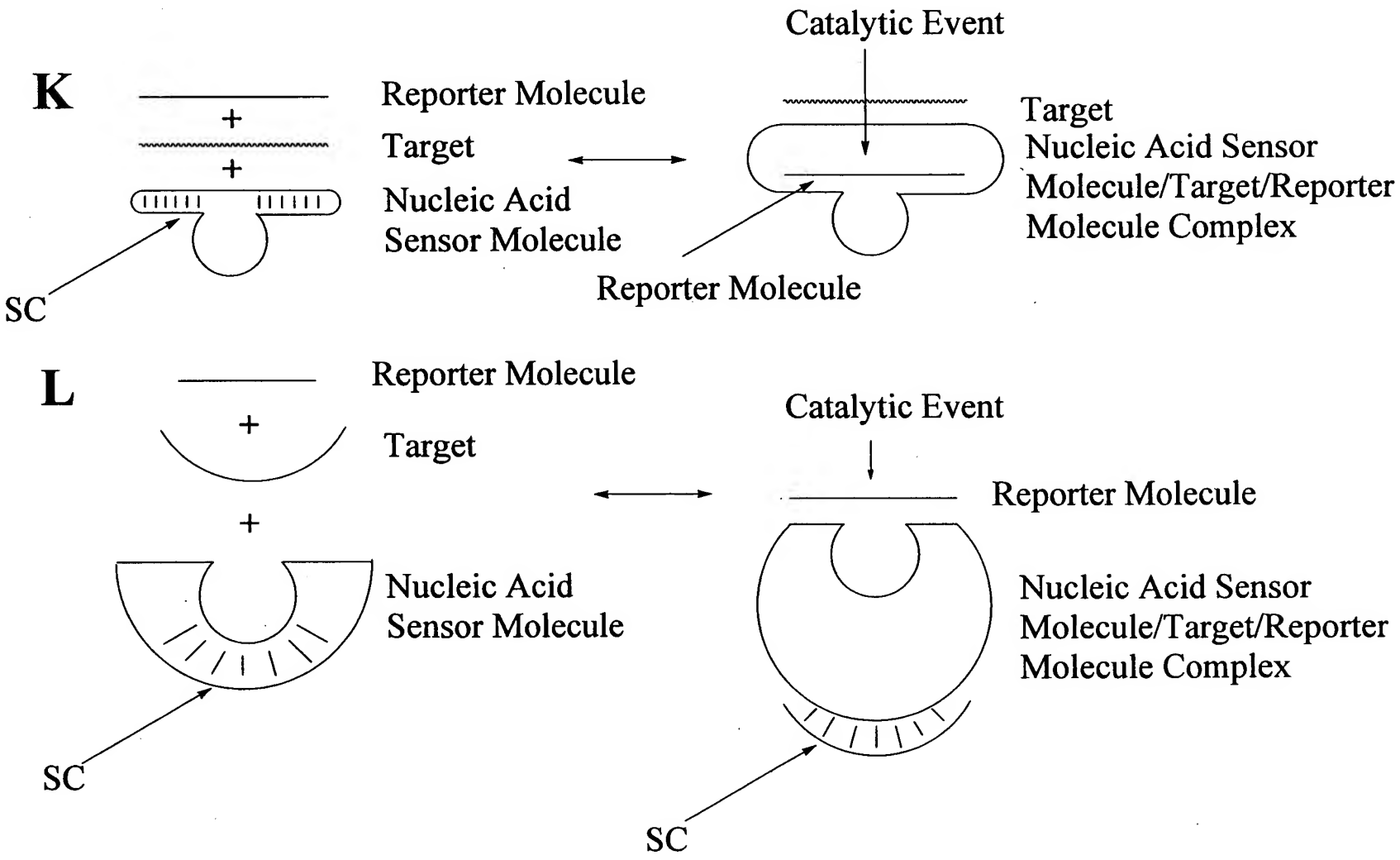


Figure 10: Examples of Diagnostic Effector Molecules



SC = Sensor Component

Figure 11: Examples of Diagnostic Effector Molecules

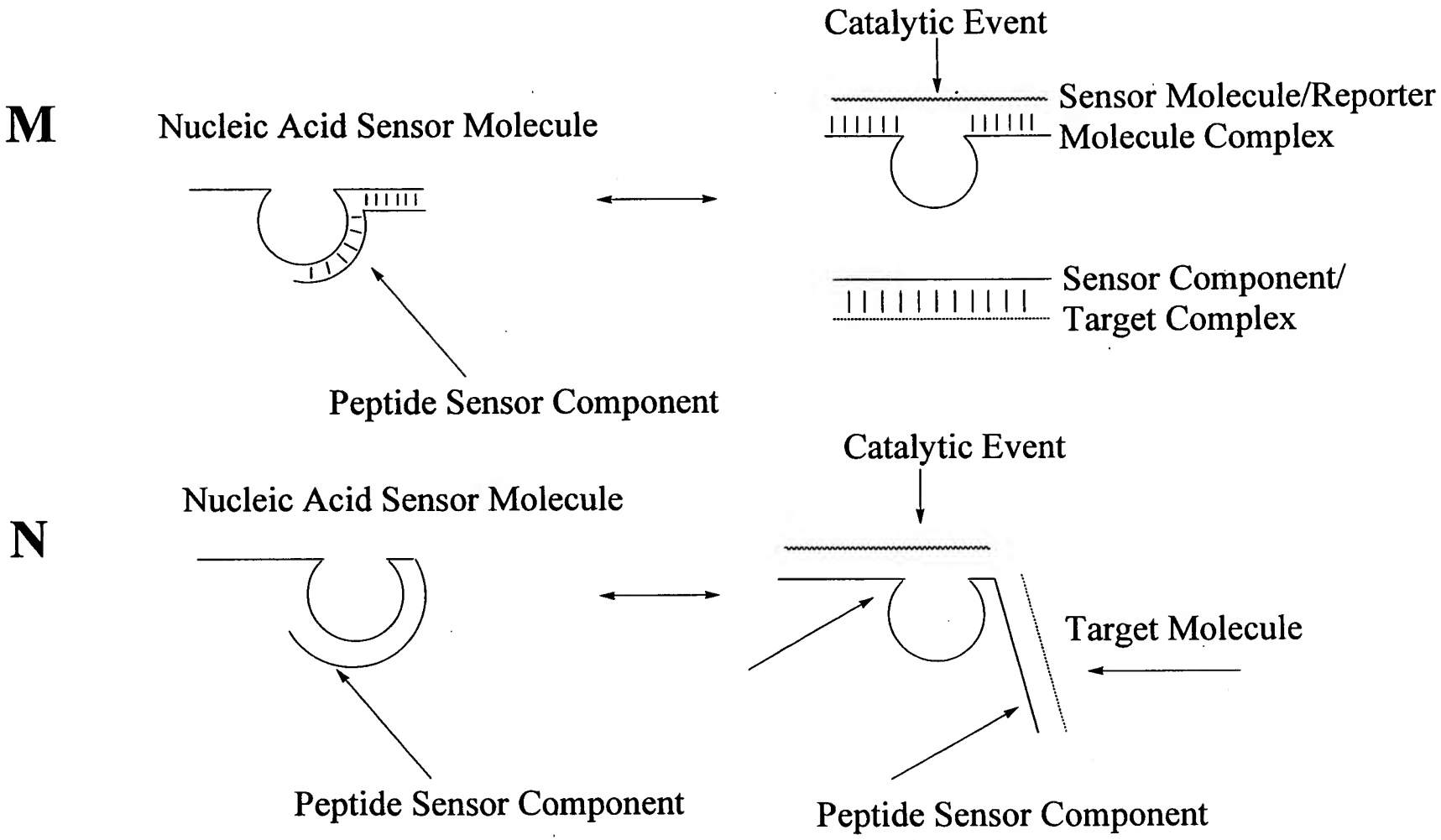
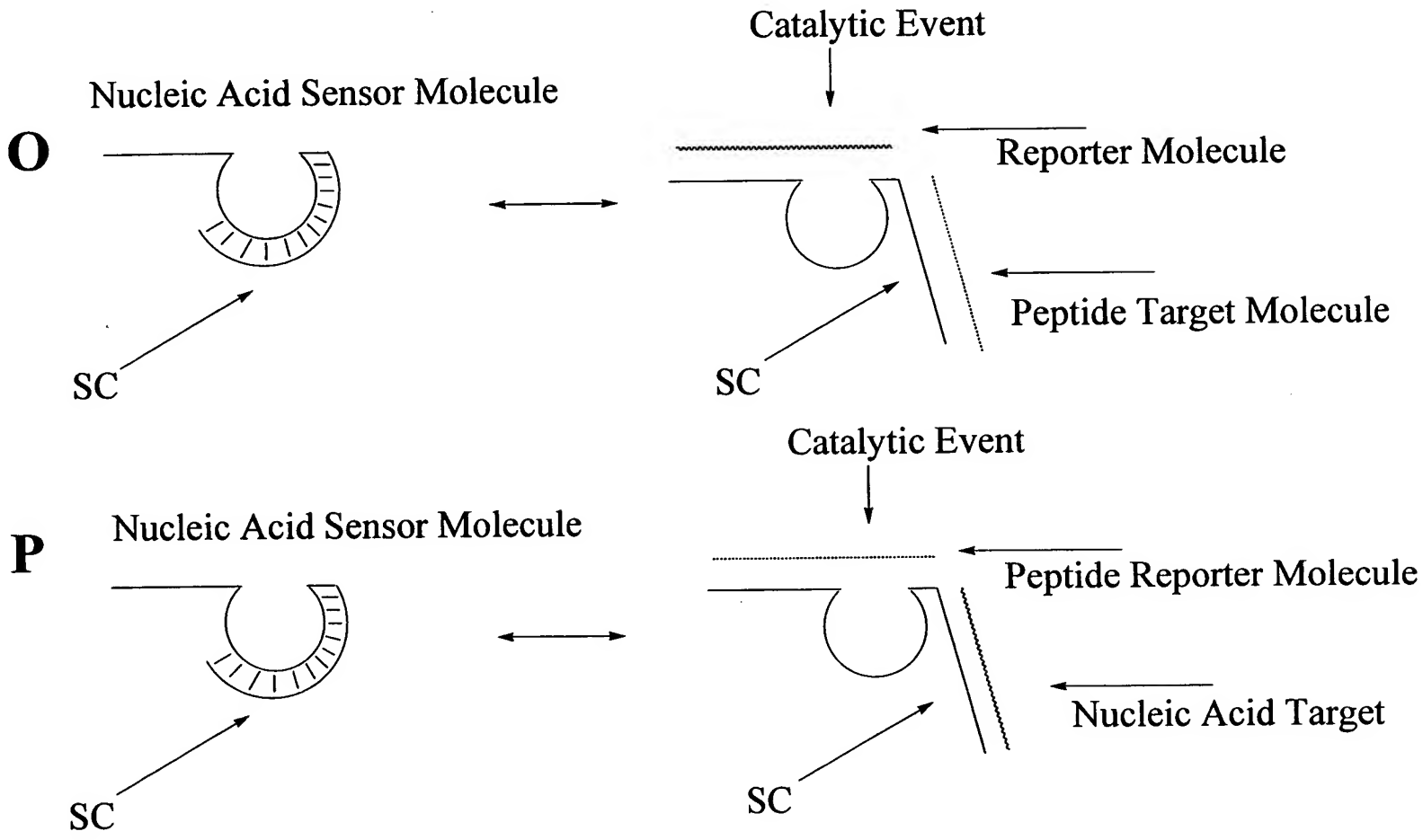


Figure 12: Examples of Diagnostic Effector Molecules



SC = Sensor Component

Figure 13: Examples of Diagnostic Effector Molecules

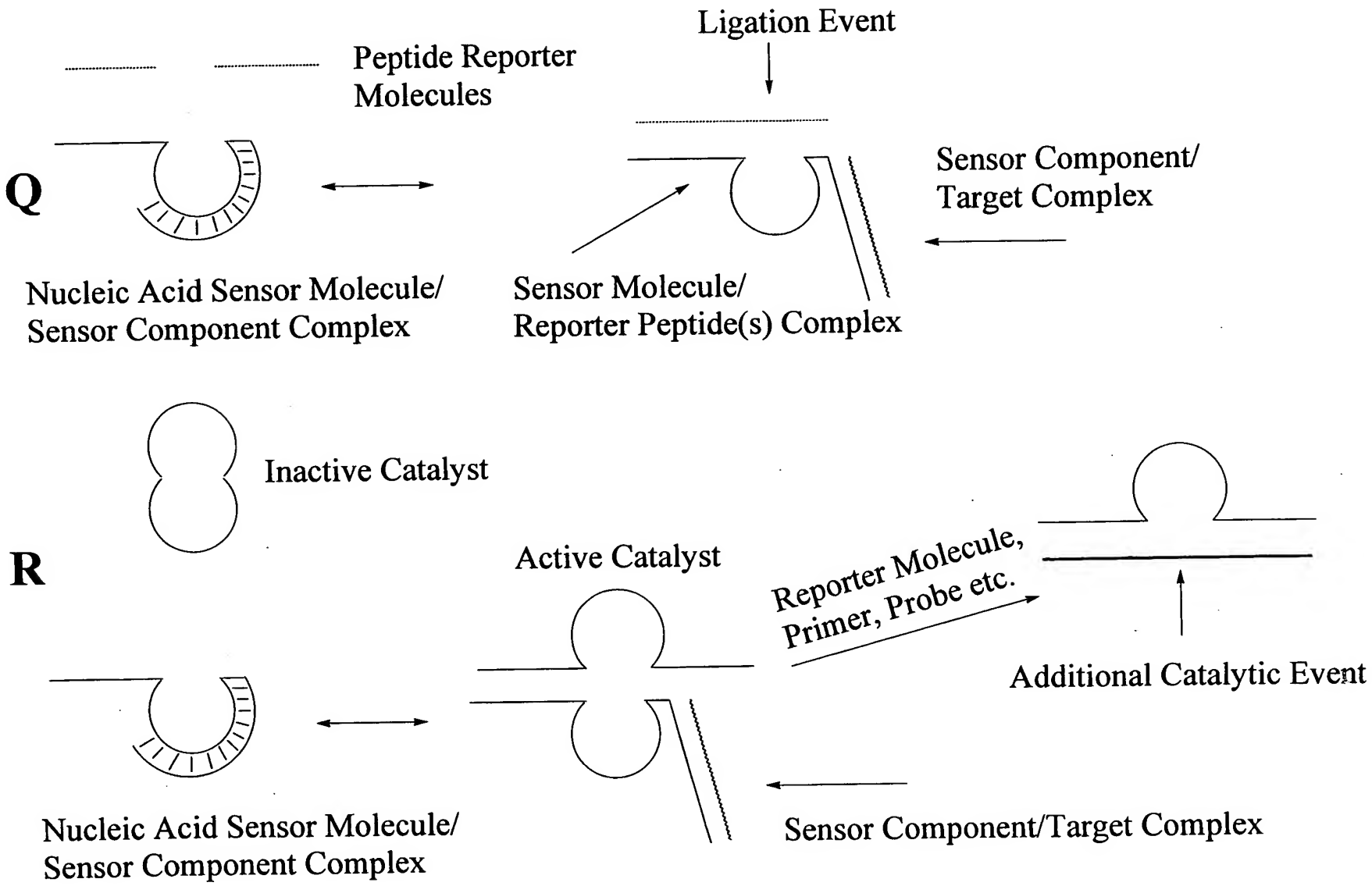


Figure 14: Inherent Amplification of Signal

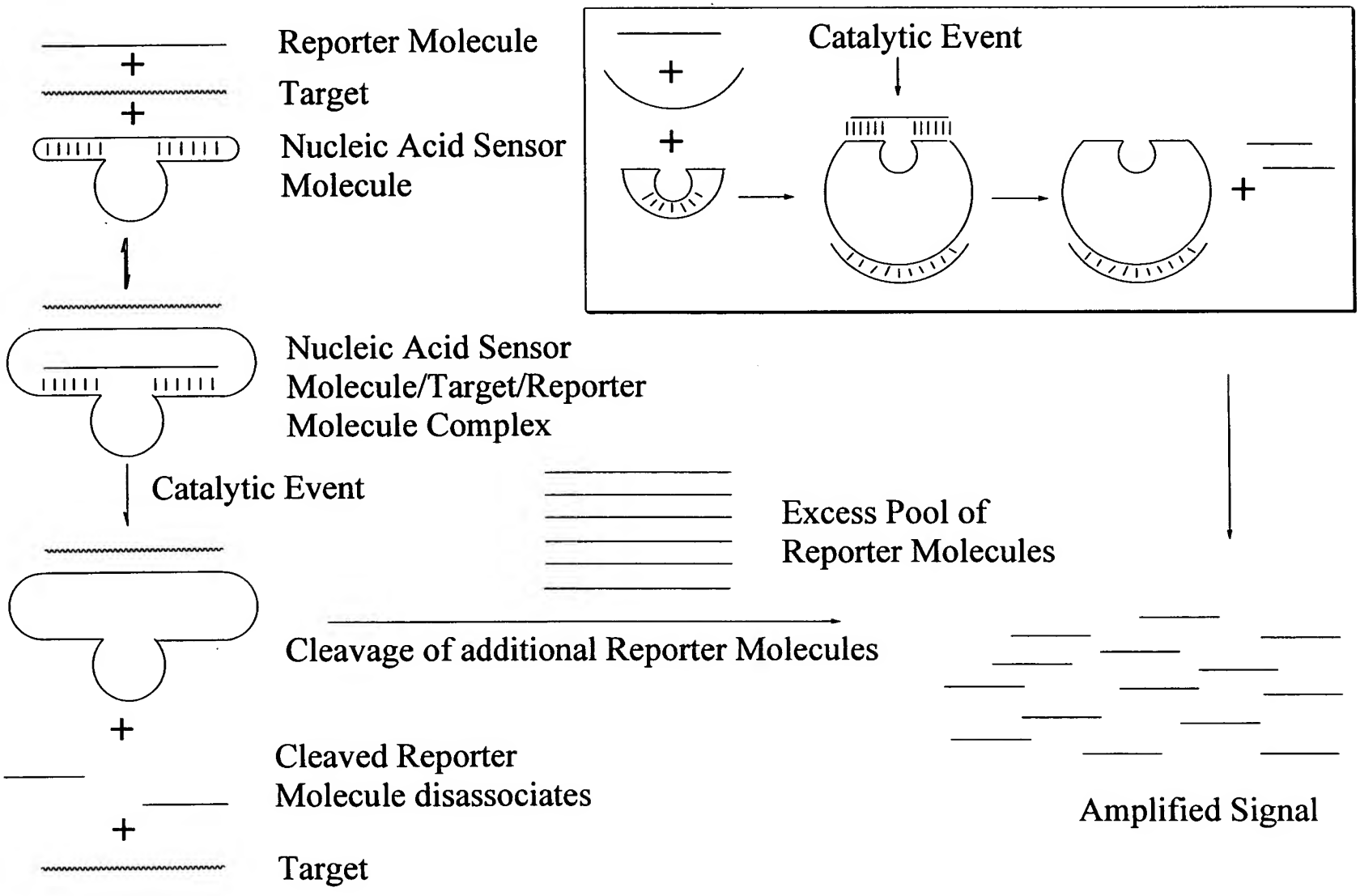


Figure 15: Example of Diagnostic System

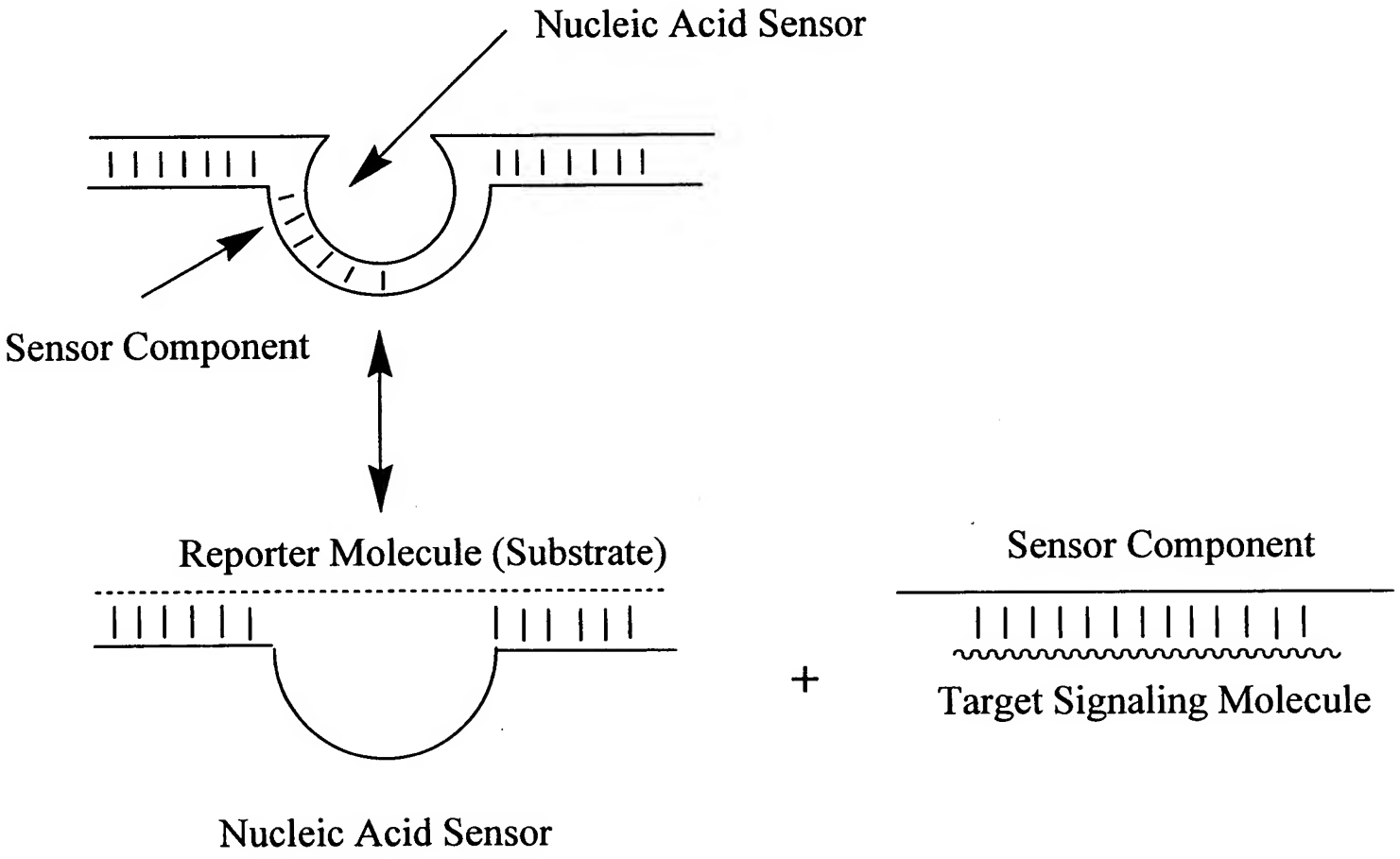


Figure 16: Ribozyme Diagnostic Screen

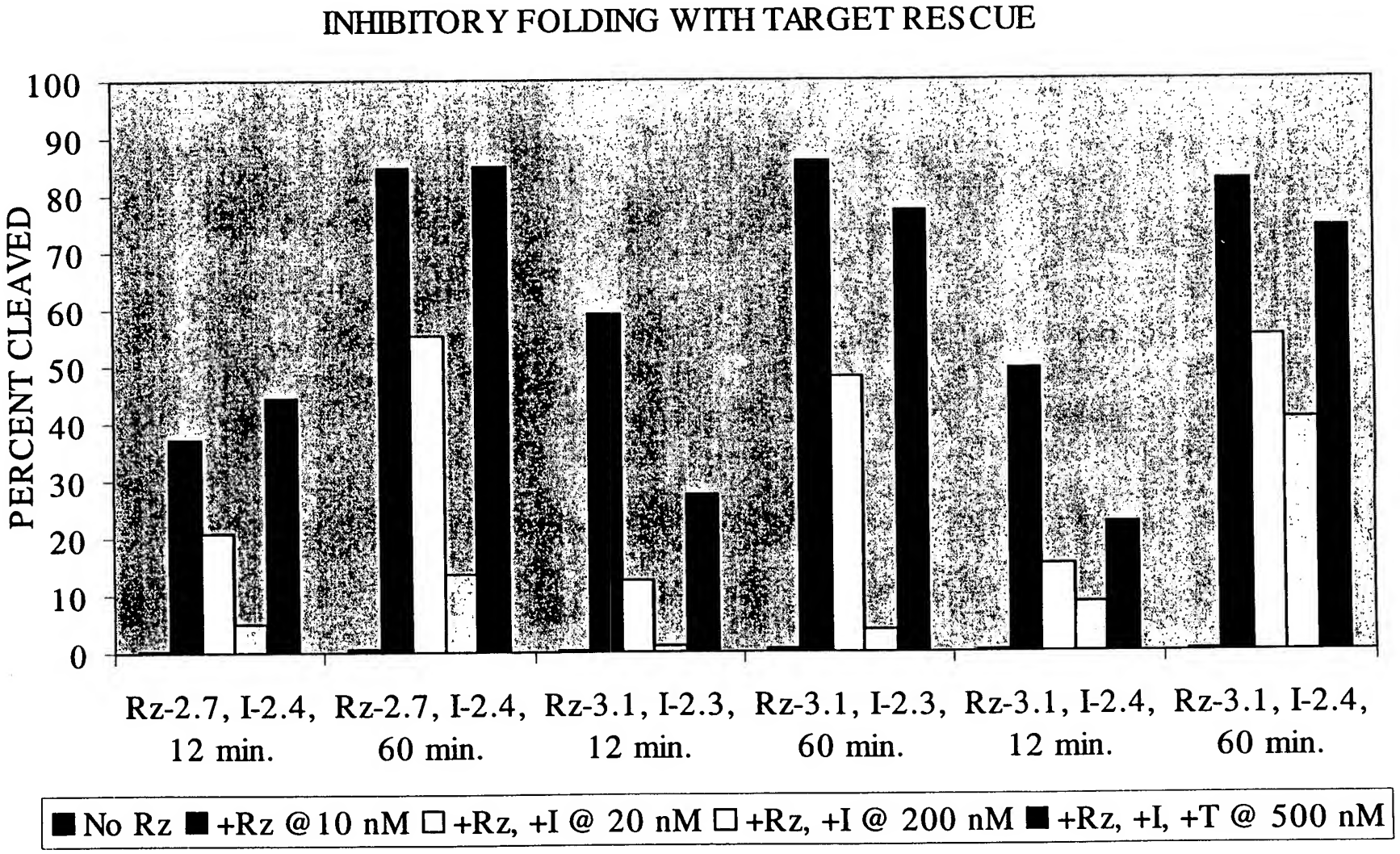


Figure 17a: Auto-ligation Nucleic Acid Sensor Molecules - Selection Scheme

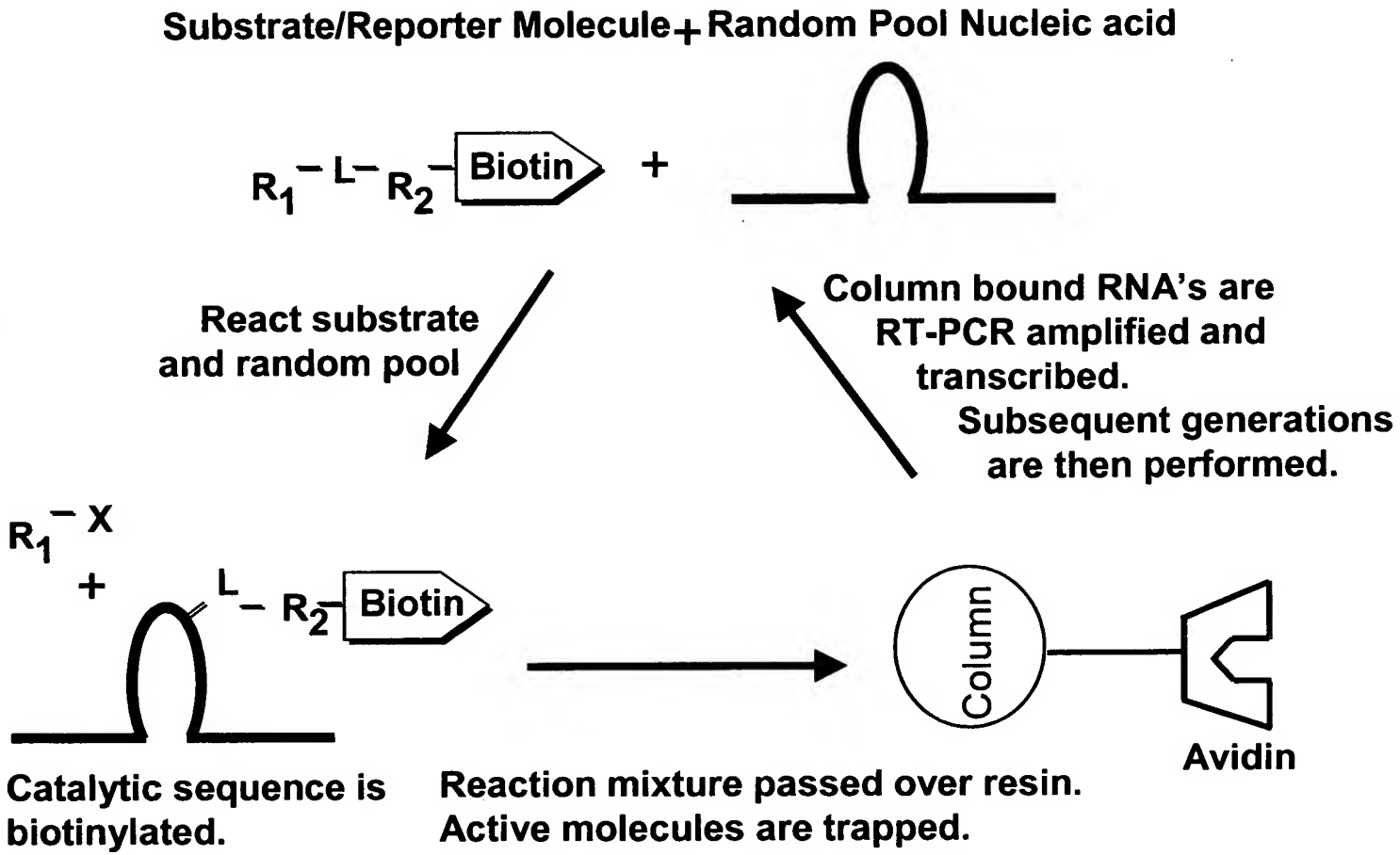


Figure 17b: Auto-ligation Nucleic Acid Sensor Molecules - Ligand Dependent

Substrate/Reporter Molecule + Random Pool Nucleic acid

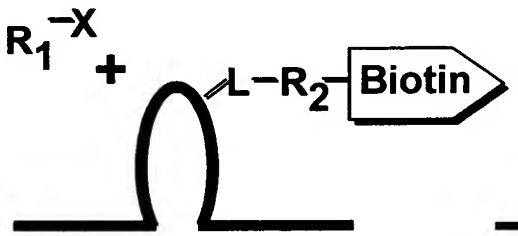
- Ligand (first round)

+ Ligand (second round)

Scheme I

React substrate and random pool

Perform this reaction (in the absence of the Ligand) and disregard the molecules that bind to the Avidin resin.
Collect all RNA's that flow through the avidin resin and repeat the reaction in the presence of the Ligand.
Collect and RT-PCRamplify and transcribe these molecules for subsequent rounds.



Catalytic sequence is biotinylated.

Reaction mixture passed over resin. Active molecules are trapped.

Figure 17c: Auto-ligation Nucleic Acid Sensor Molecules- Ligand dependent

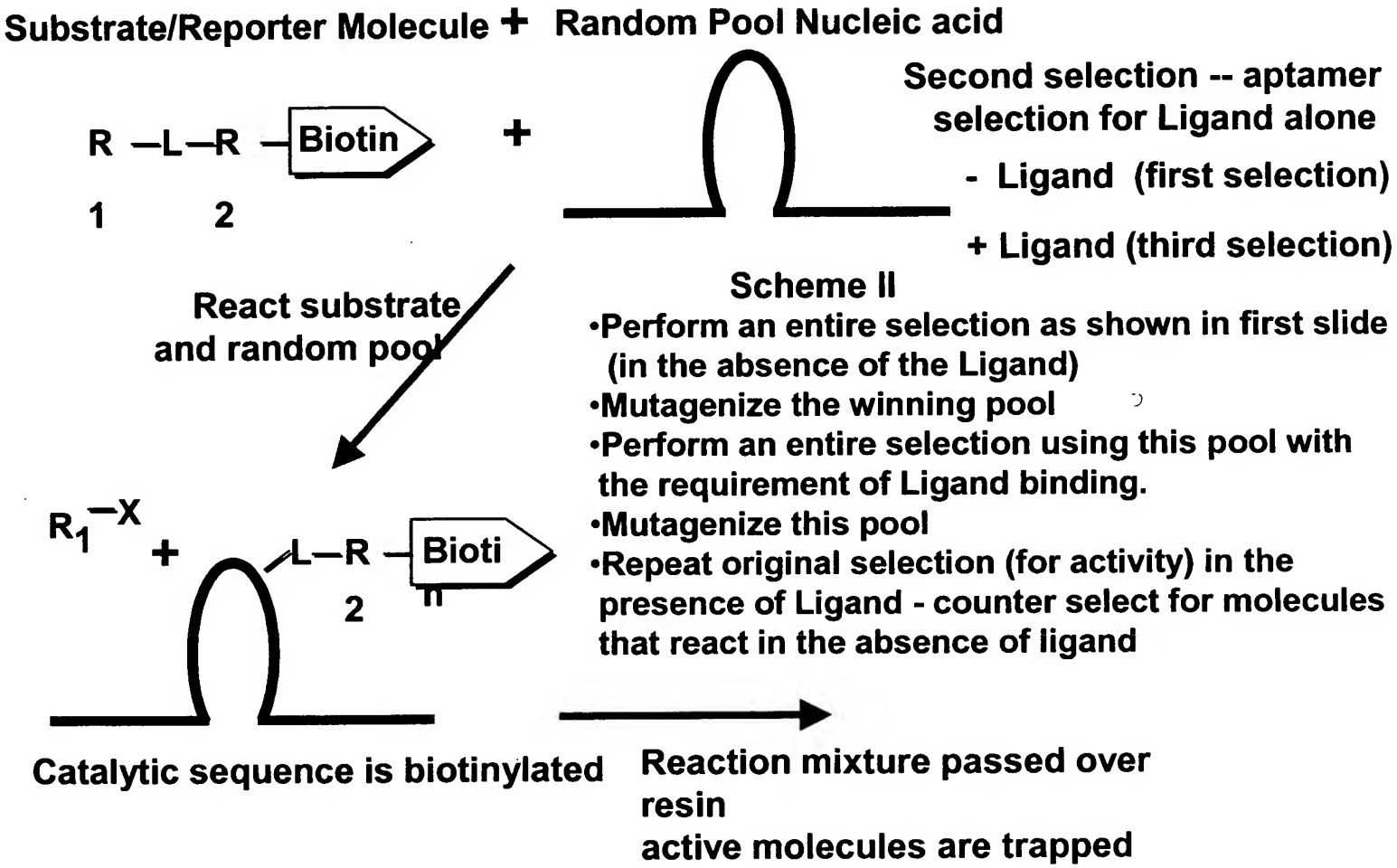


Figure 18a: Isomerase Nucleic Acid Sensor Molecule - Selection Scheme

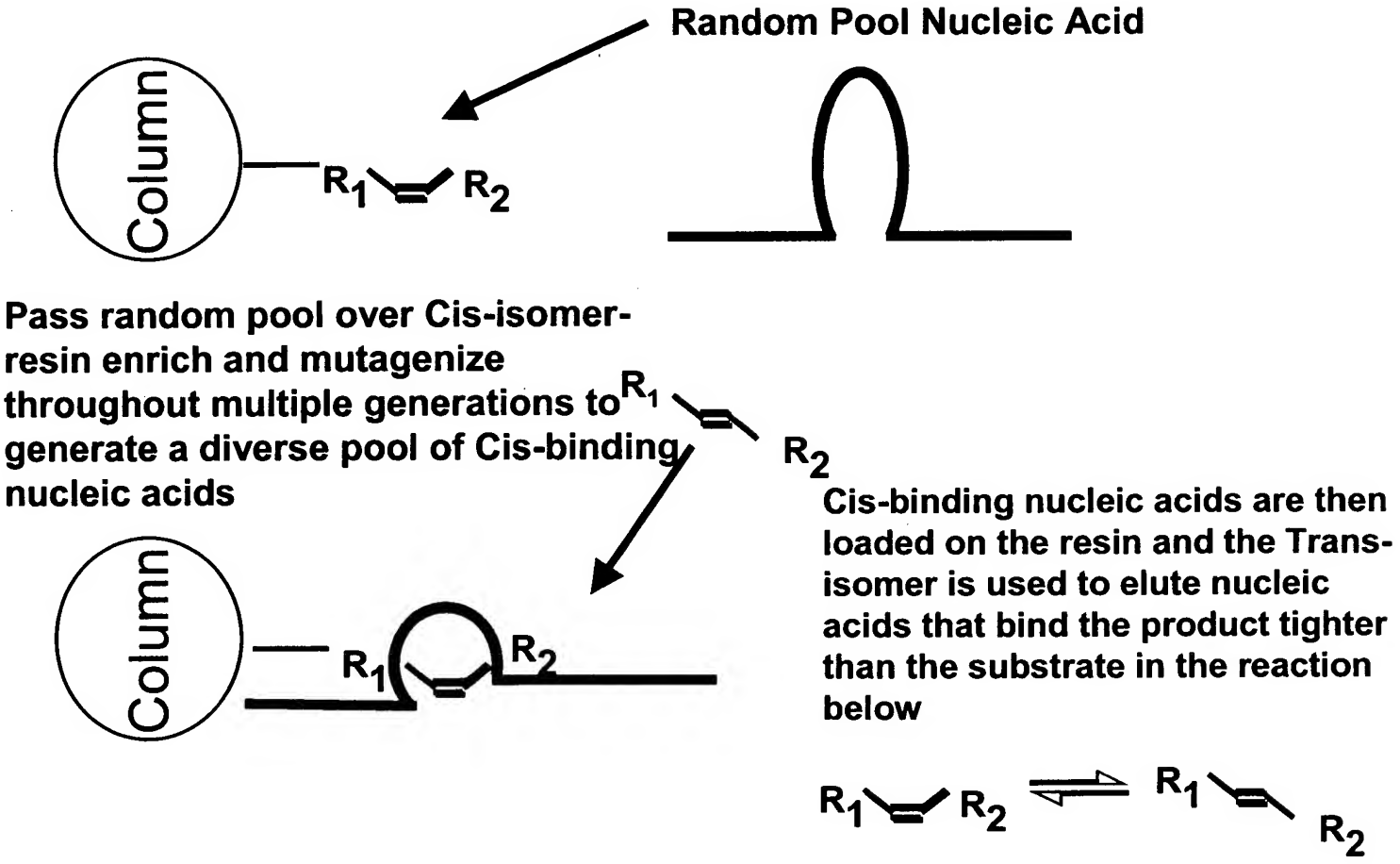
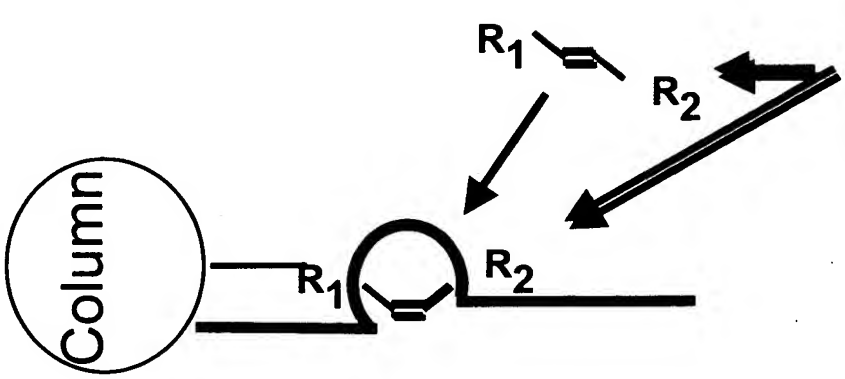


Figure 18b: Isomerase Nucleic Acid Sensor Molecule - Selection Scheme



The concentration of ligand on the resin and the concentration of eluant ligand can be manipulated in order to bias for enzymatic nucleic acids that prefer one isomer over the other -and can therefore drive the reaction in a desired direction.

E.g. Selection for Cis-isomer at 100 uM - yeild $^{cis}K_d$ = 100 Um

Elute with Trans-isomer at 0.1 uM - yield $^{trans}K_d$ = 0.1 uM

Isolate catalysts for the reaction below

Figure 18c: Isomerase Nucleic Acid Sensor Molecule - Ligand dependent

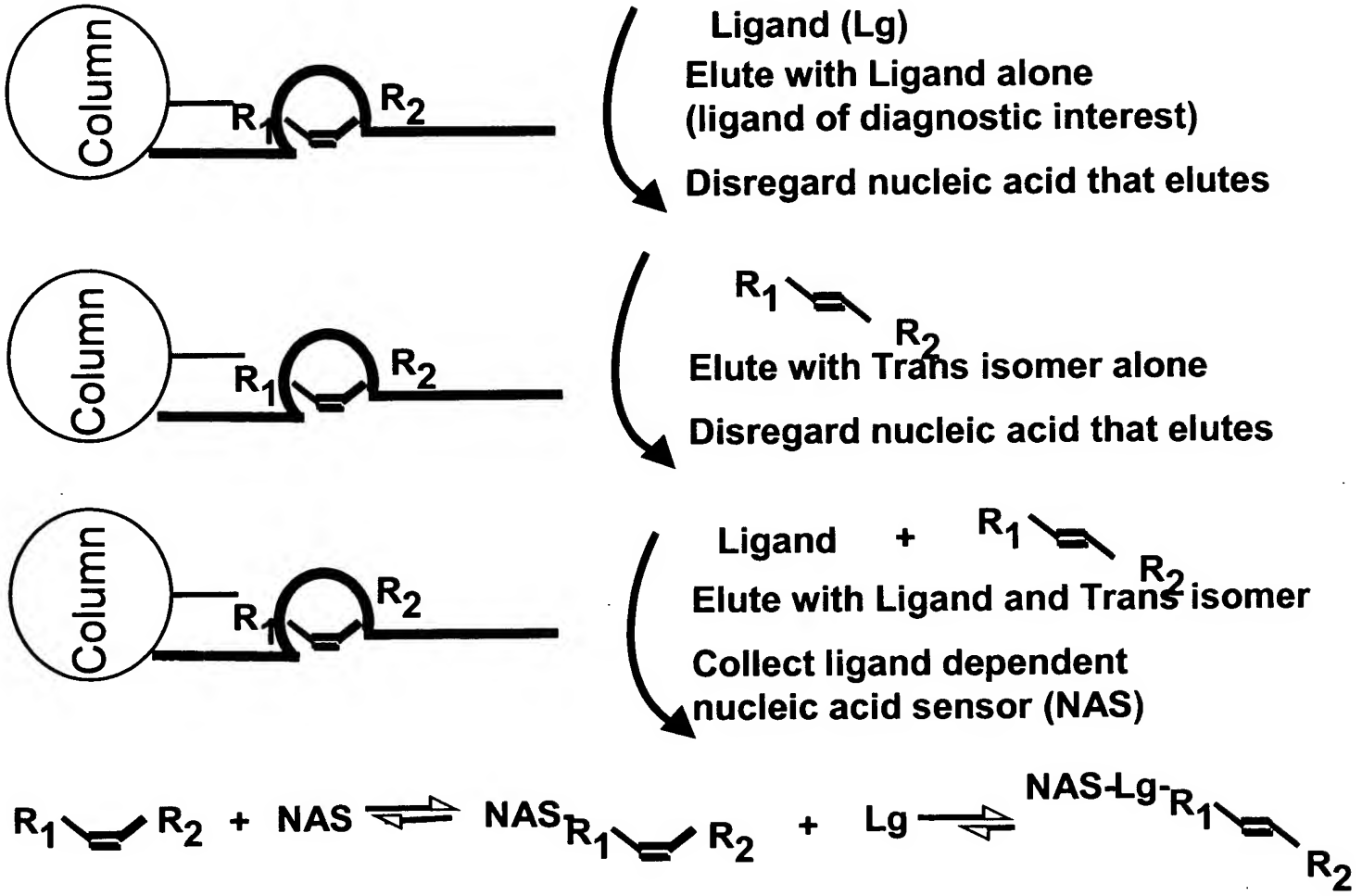
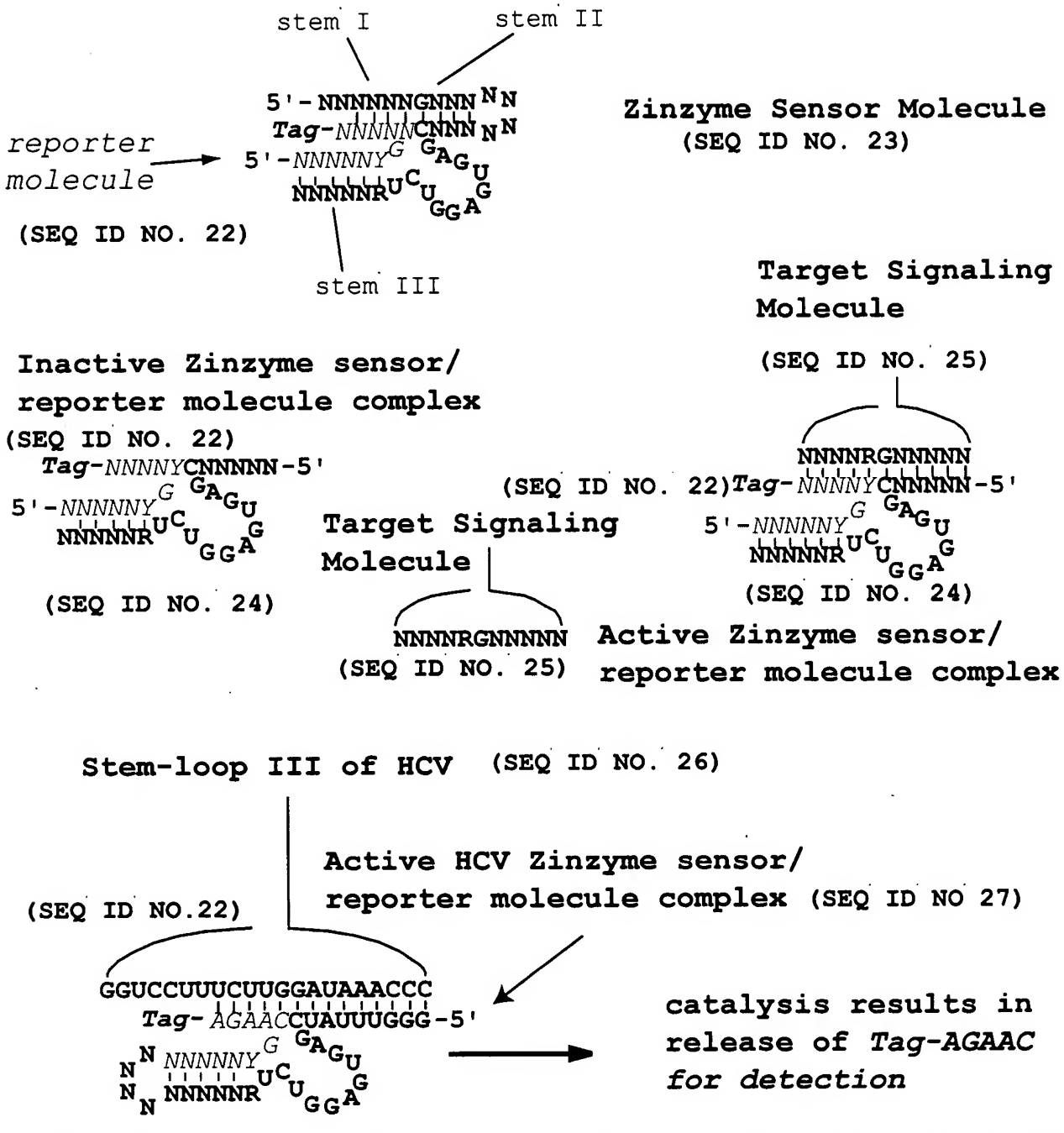
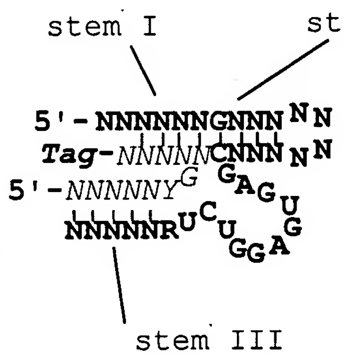


Figure 19: Zinzyme Sensor Molecule for detection of Nucleic Acid



Zinzyme sensor can be attached to solid support/surface, for example at the 5'-end

Figure 20: Zinzyme Sensor Molecule for detection of Protein



Zinzyme Sensor Molecule

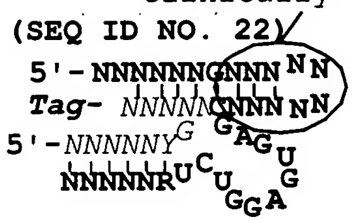
(SEQ ID NO. 23)

reporter molecule

(SEQ ID NO. 22)

(SEQ ID NO. 23)
RNA sequence that binds a clinically relevant protein

(SEQ ID NO. 22)

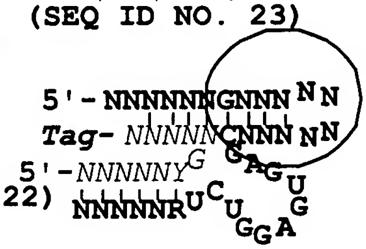


Zinzyme sensor/ reporter molecule complex

biological sample containing target protein

Protein interaction

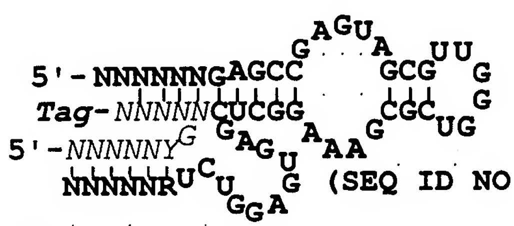
(SEQ ID NO. 23)



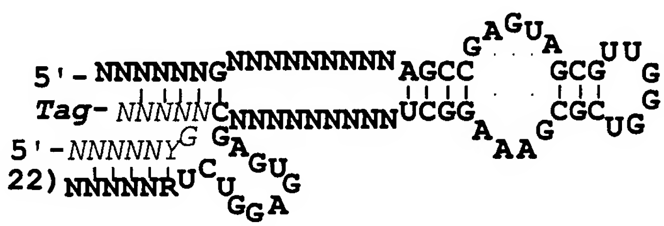
(SEQ ID NO. 22)

Activated/Inactivated Complex

Sensor/reporter complex for detection of HCV core protein



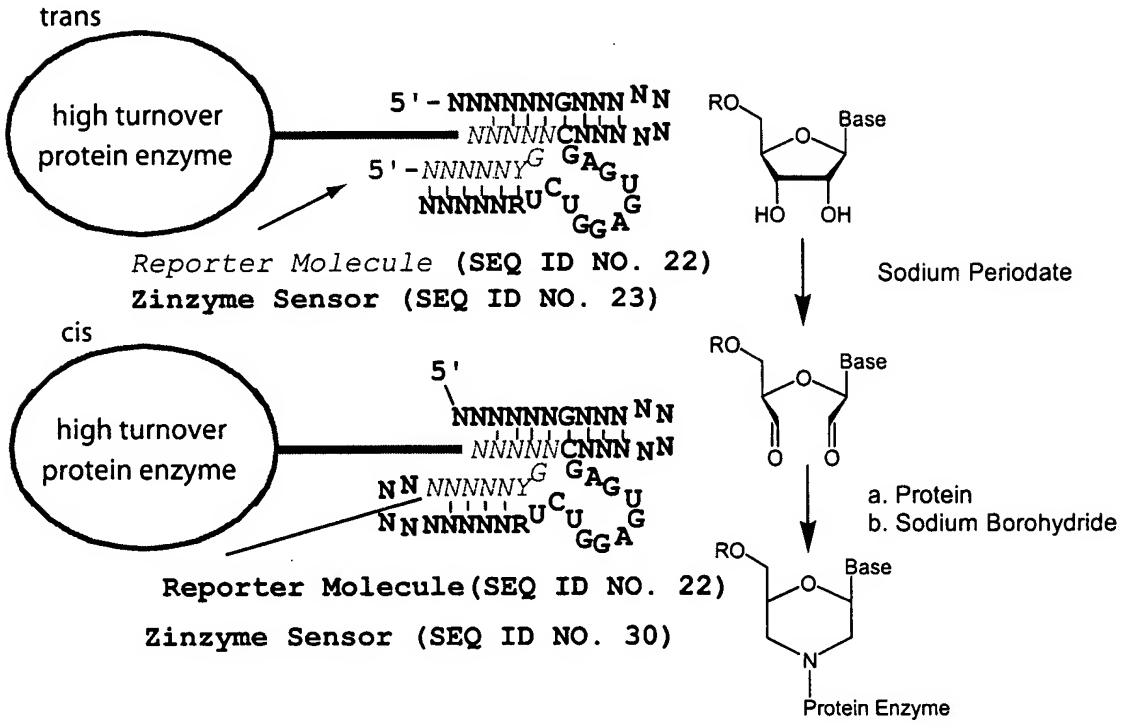
(SEQ ID NO. 22)



(SEQ ID NO. 22)
HCV Zinzyme sensor with loop IIID of HCV (directs the binding of HCV core protein)
(SEQ ID NO 28)

HCV Zinzyme sensor with loop IIID of HCV connected via randomized linker
(SEQ ID NO 29)

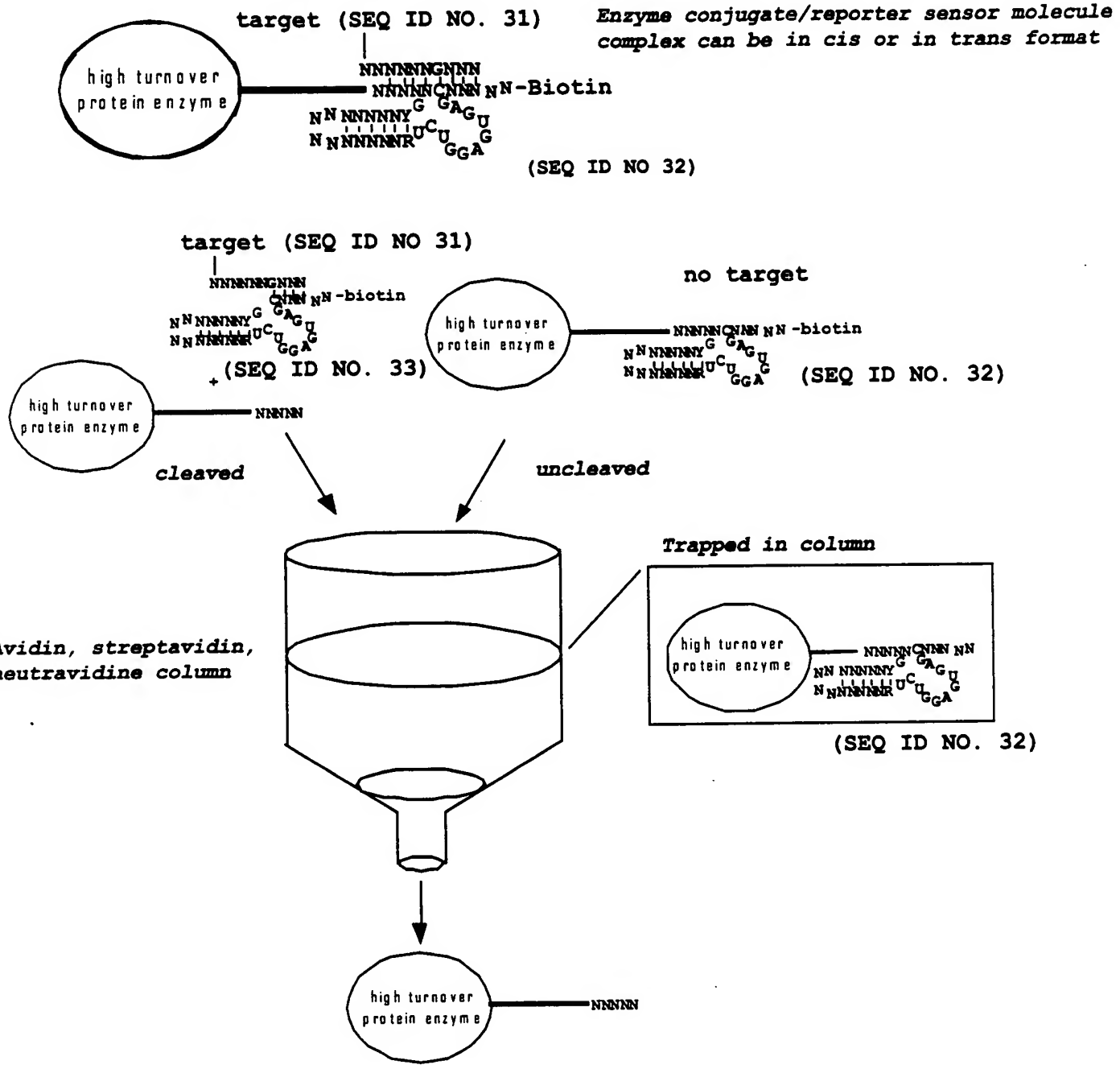
Figure 21: Zinzyme Sensor Molecule with protein enzyme reporter



R is oligonucleotide.
Protein can be attached via amino linker.
Alternately, R is phorphoramidite moiety for incorporation at 5'-end of oligonucleotide.

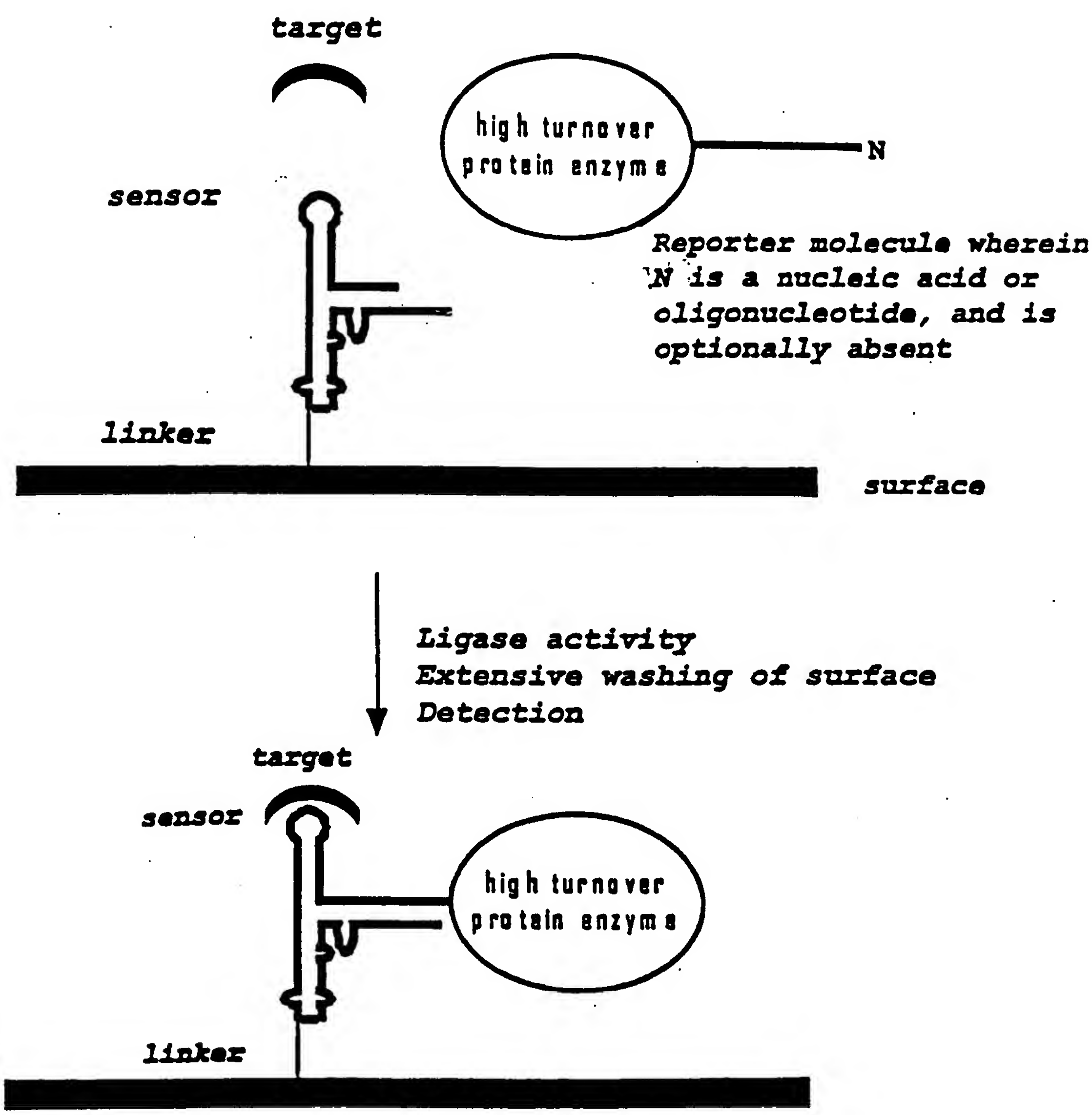
High turnover protein enzyme is, for example, Luciferase, Horseradish peroxidase, beta-galactosidase, alkaline phosphatase.

Figure 22: Amplification of Signal via use of protein enzyme conjugate



Assay column eluent to determine enzyme activity proportional to sensor molecule activity.

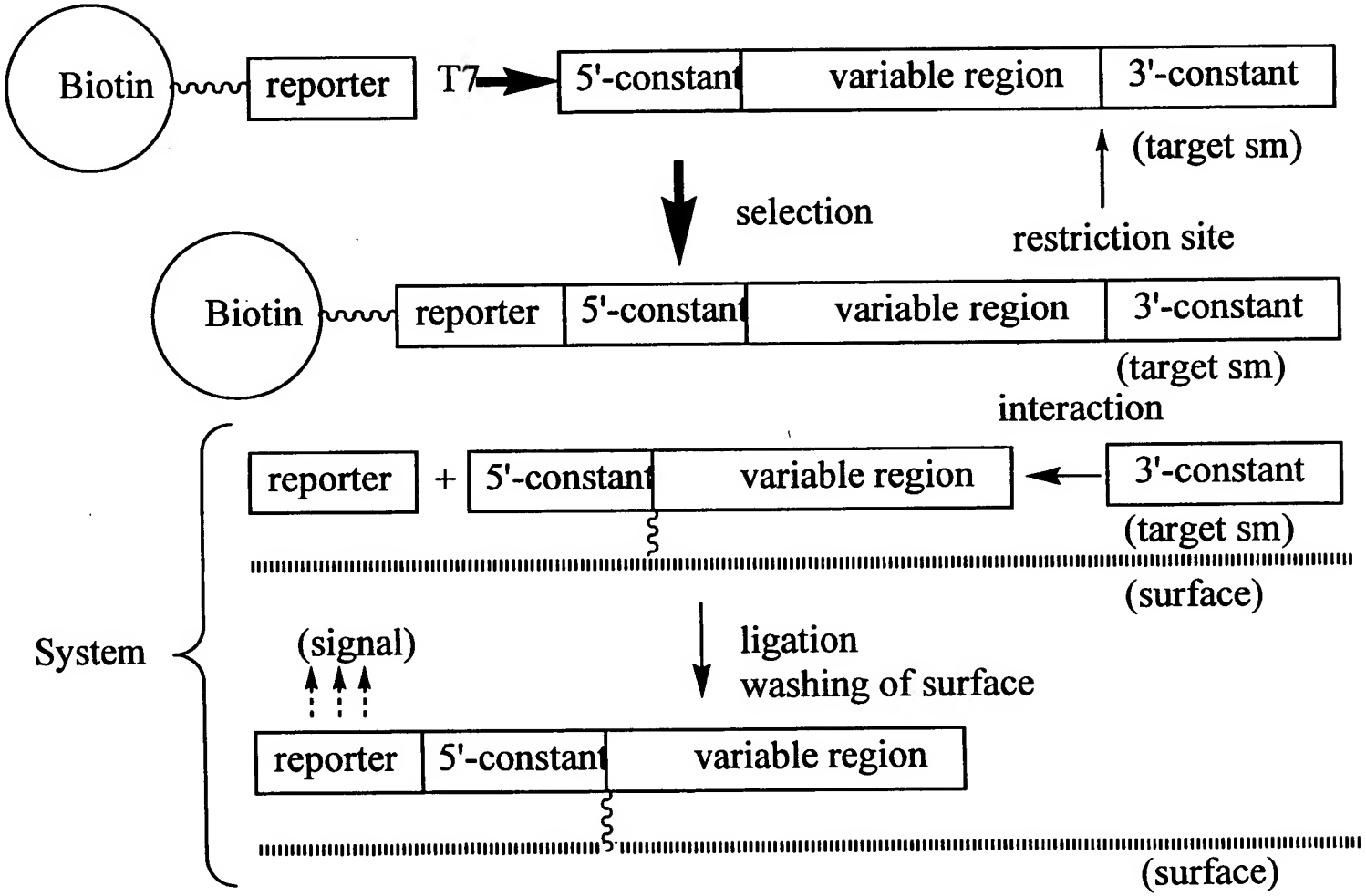
Ligase Sensor Molecule with enzymatic reporter



Alternatively, a fluorescent or chemiluminescent based reporter molecule is used.

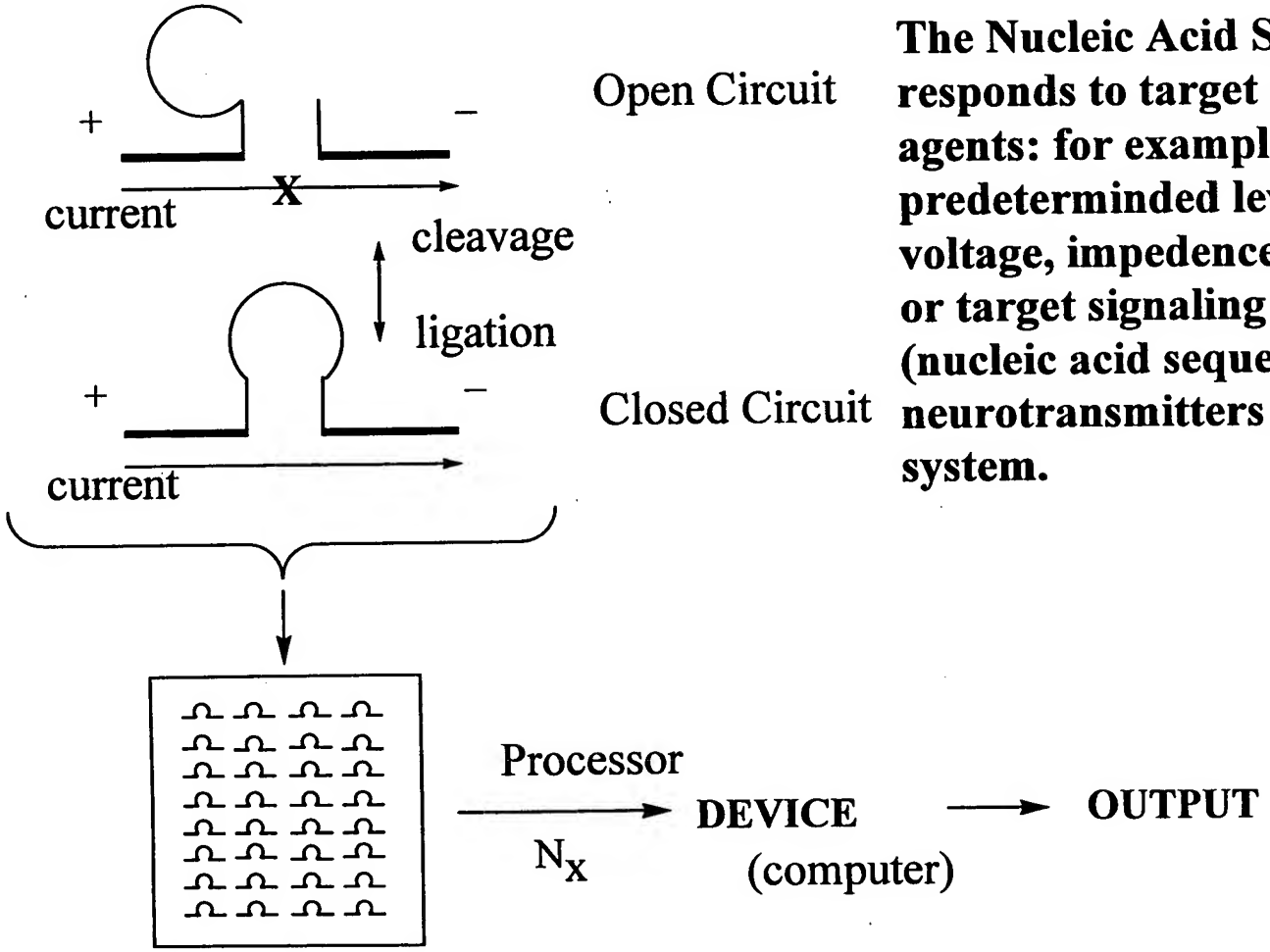
FIG. 23

Figure 24: Selection of Nucleic Acid Sensor Molecules with Ligase Activity



(sm= signaling molecule)

Figure 25: Nucleic Acid Sensor Molecule-Based Electric Cirucuit



The Nucleic Acid Sensor Circuit responds to target signaling agents: for example predeterminded levels of current, voltage, impedence, or target signaling molecules (nucleic acid sequences, peptides, neurotransmitters etc.) in a system.

Figure 26: Target Inactivation of Zinzyme Sensor Molecule

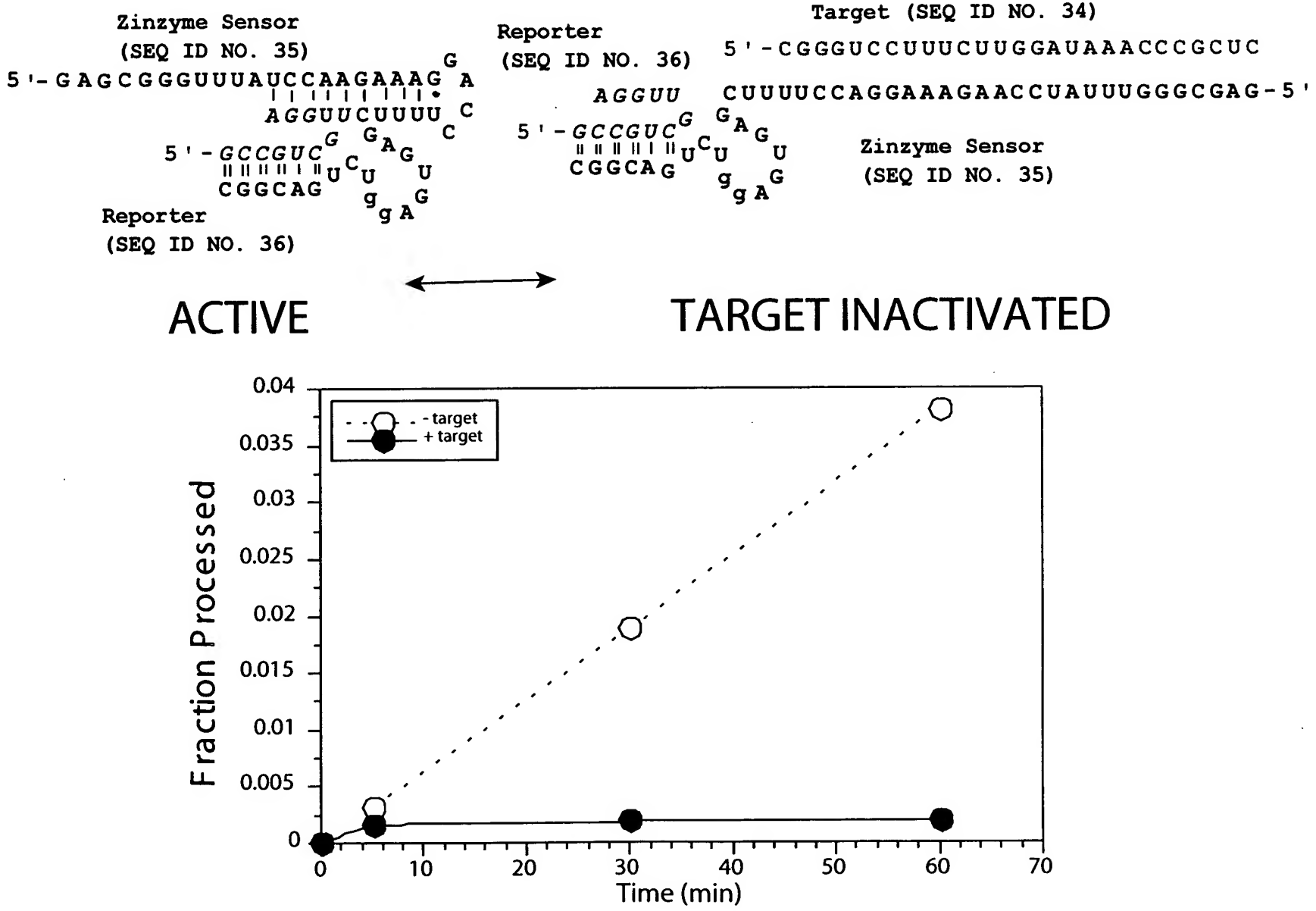


Figure 27: Target Activation of Zinzyme Sensor Molecule

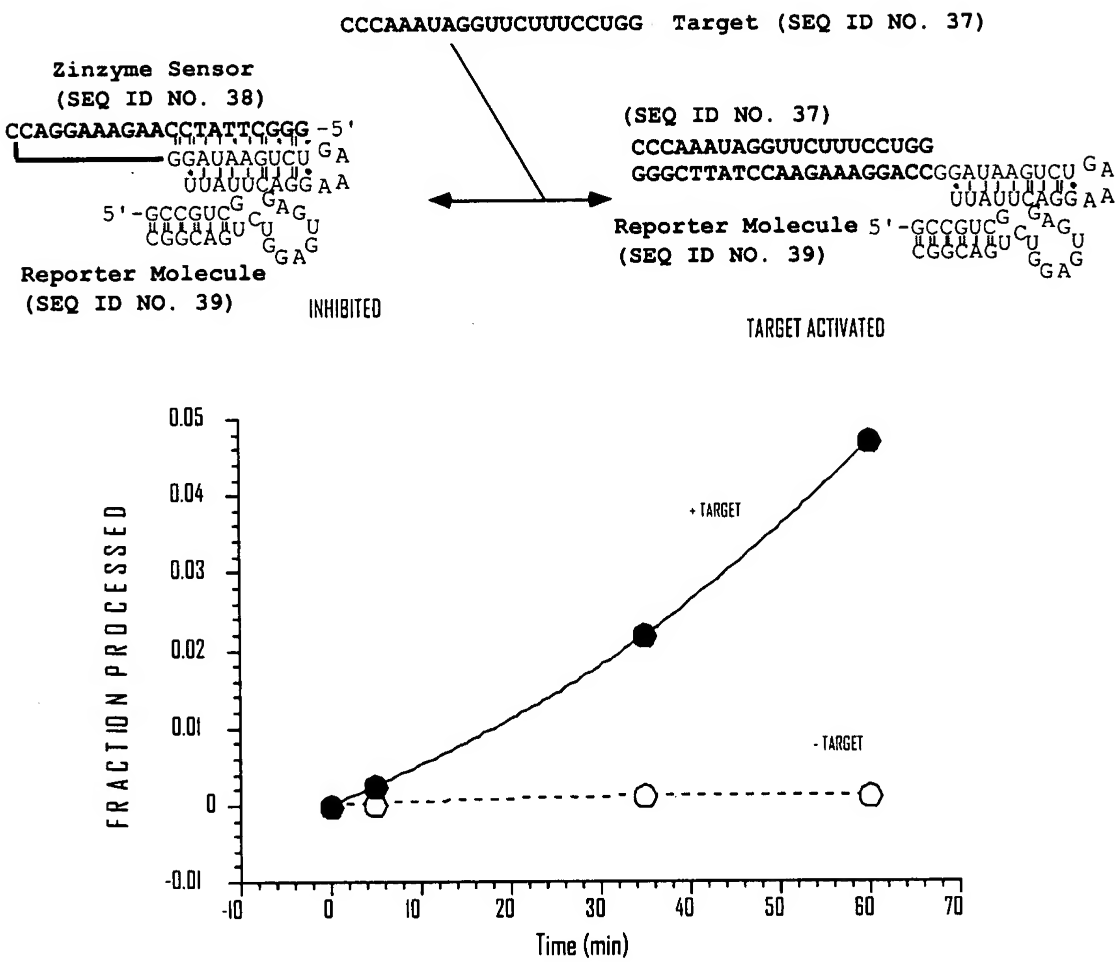
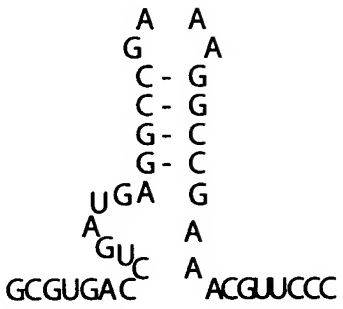
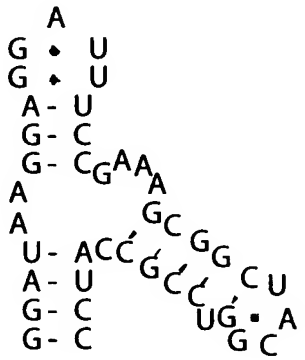


Figure 28: Erk modulated Nucleic Acid Sensor Molecule



HAMMERHEAD (HH)

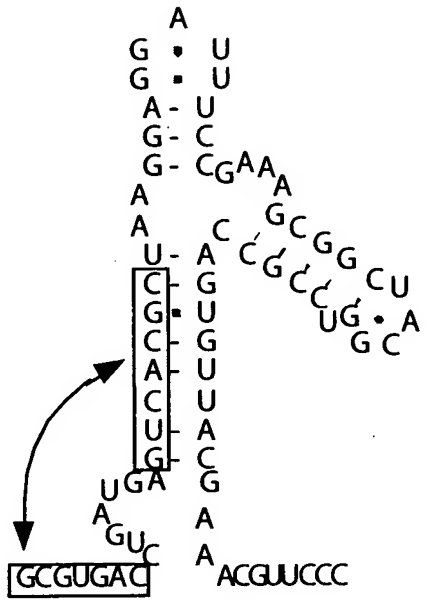
(SEQ ID NO. 40)



ERK SENSOR COMPONENT

K_D=300 pM

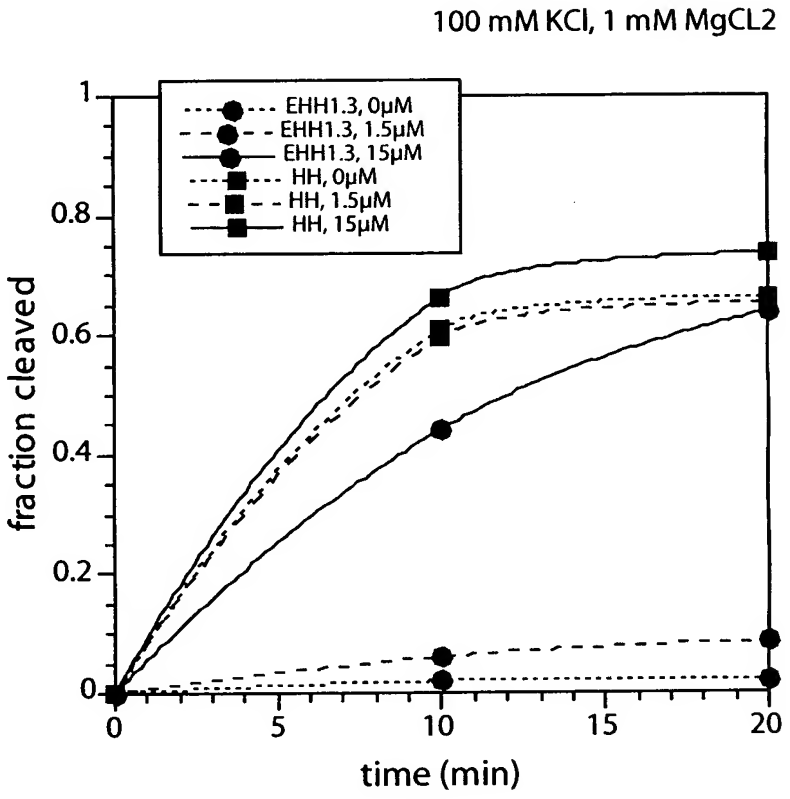
(SEQ ID NO. 41)



EHH1.3 sensor molecule

K_D=570 nM

(SEQ ID NO. 42)



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Serial No. TBA; MBHB00-816-E
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Figure 29: Half-Zinzyme Construct

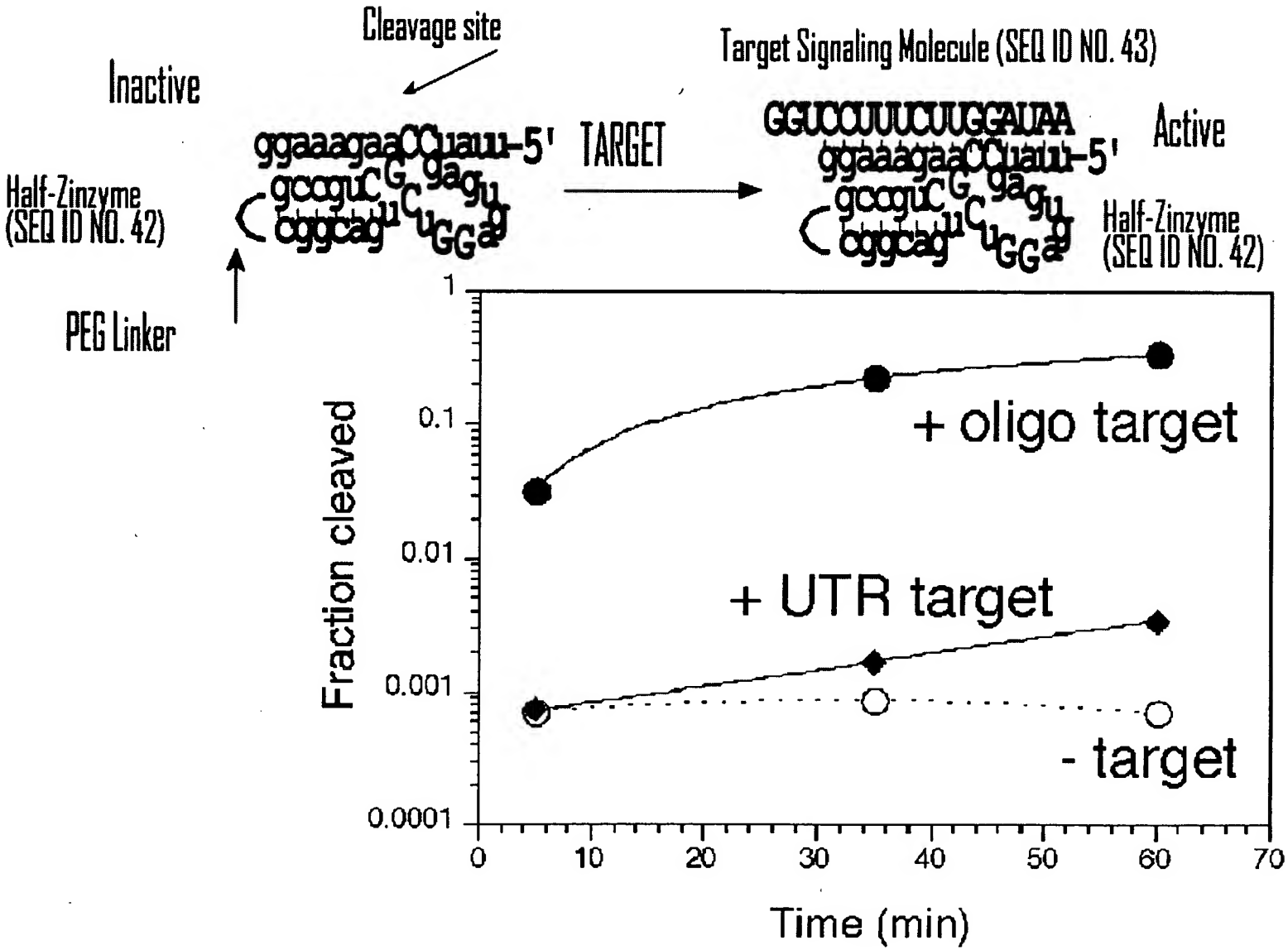
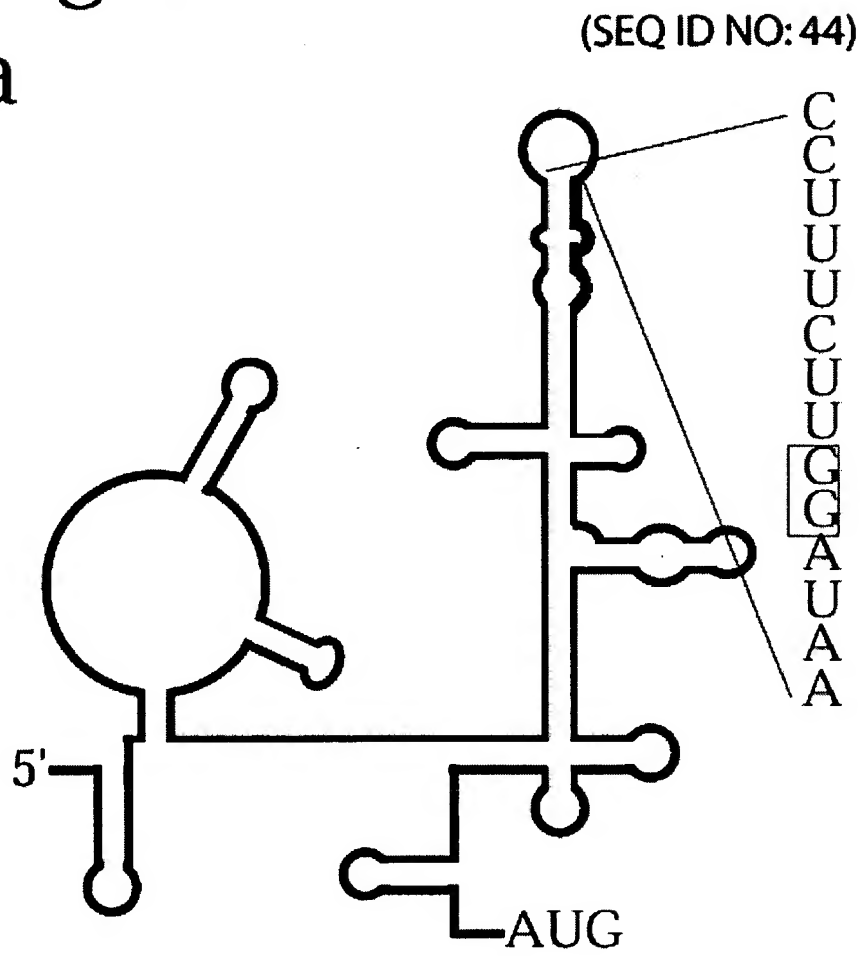


Figure 30

a



b

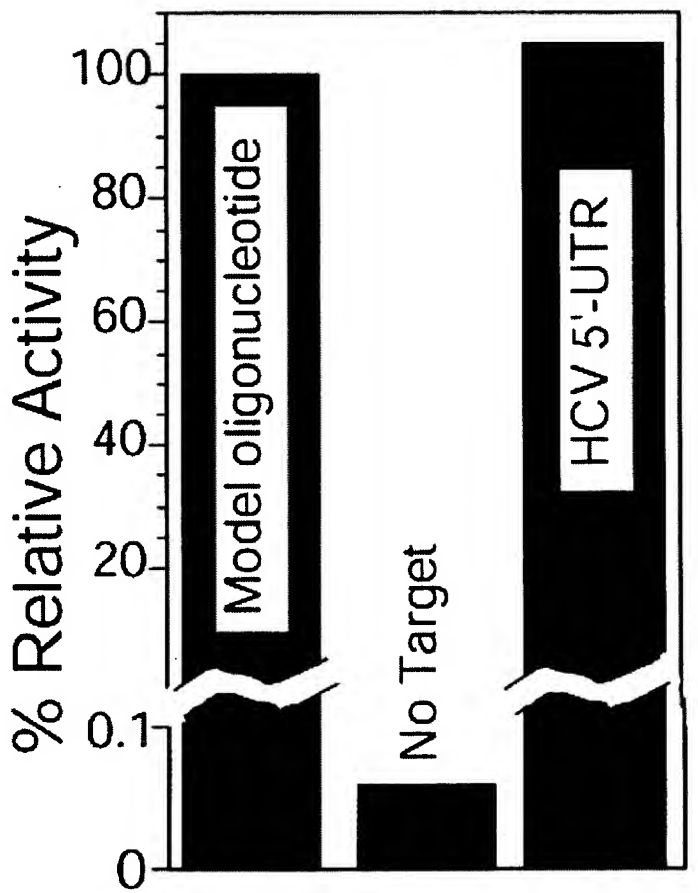
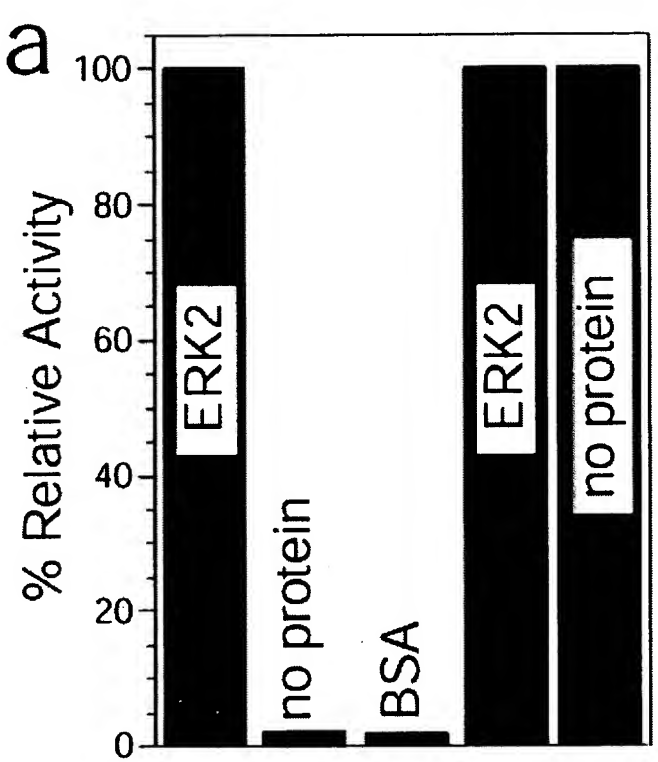


Figure 31



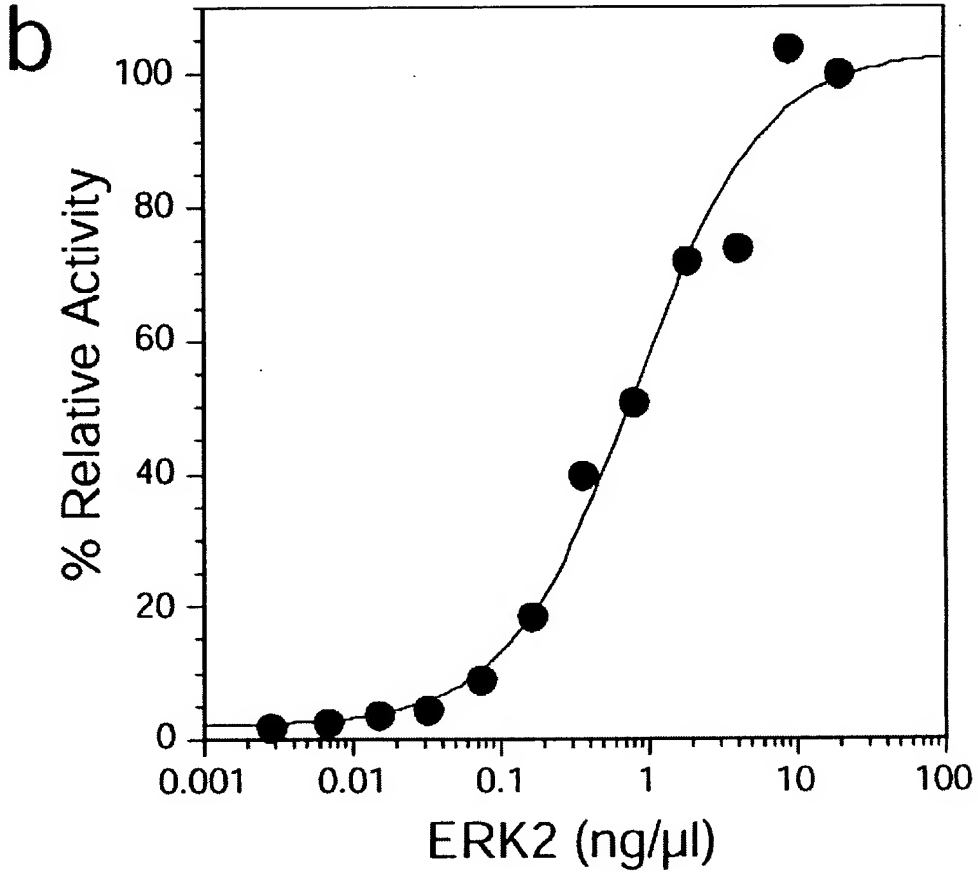


Figure 32

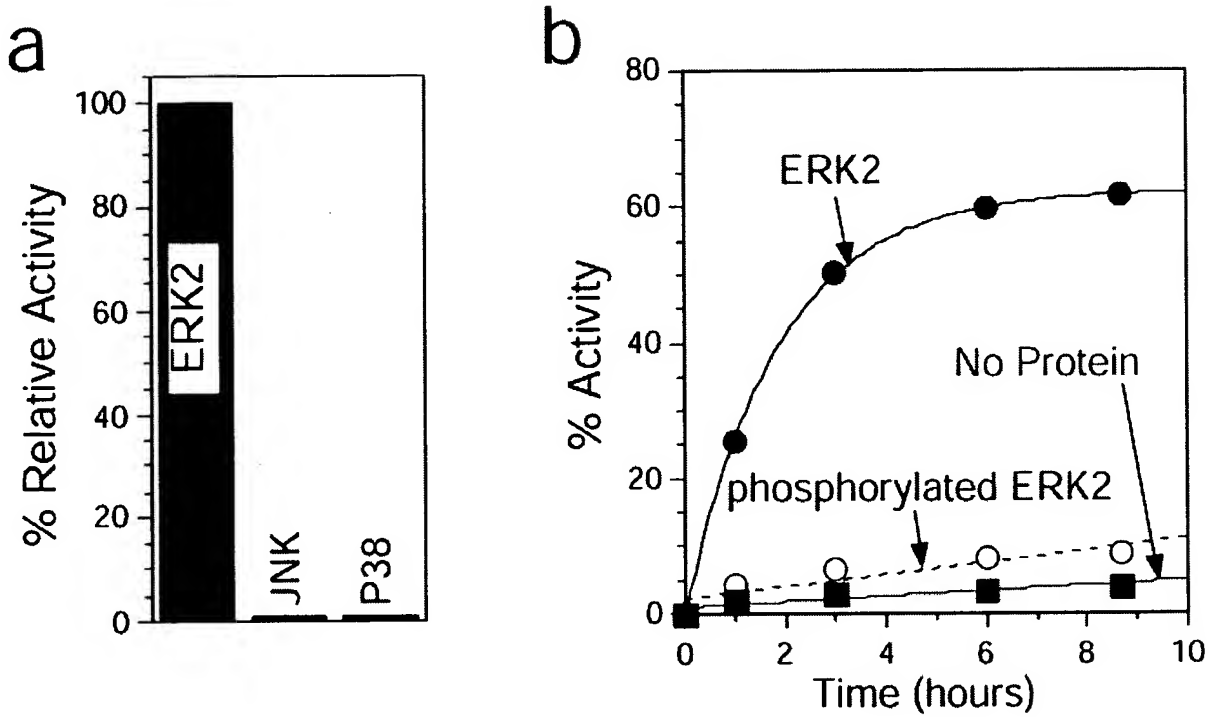


Figure 33: Halfzyme Ligase

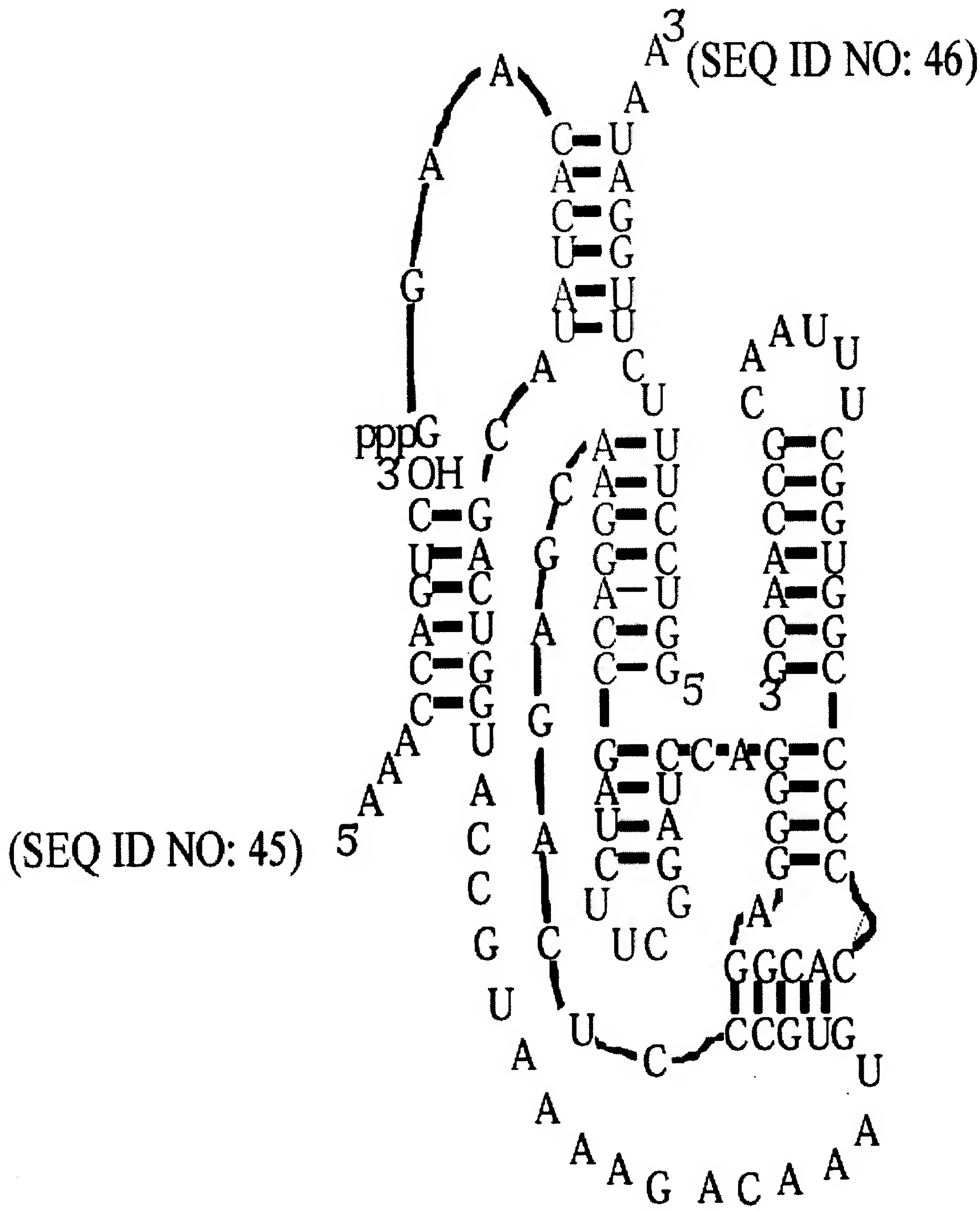


Figure 34: Secondary structure of HCV 5'-UTR

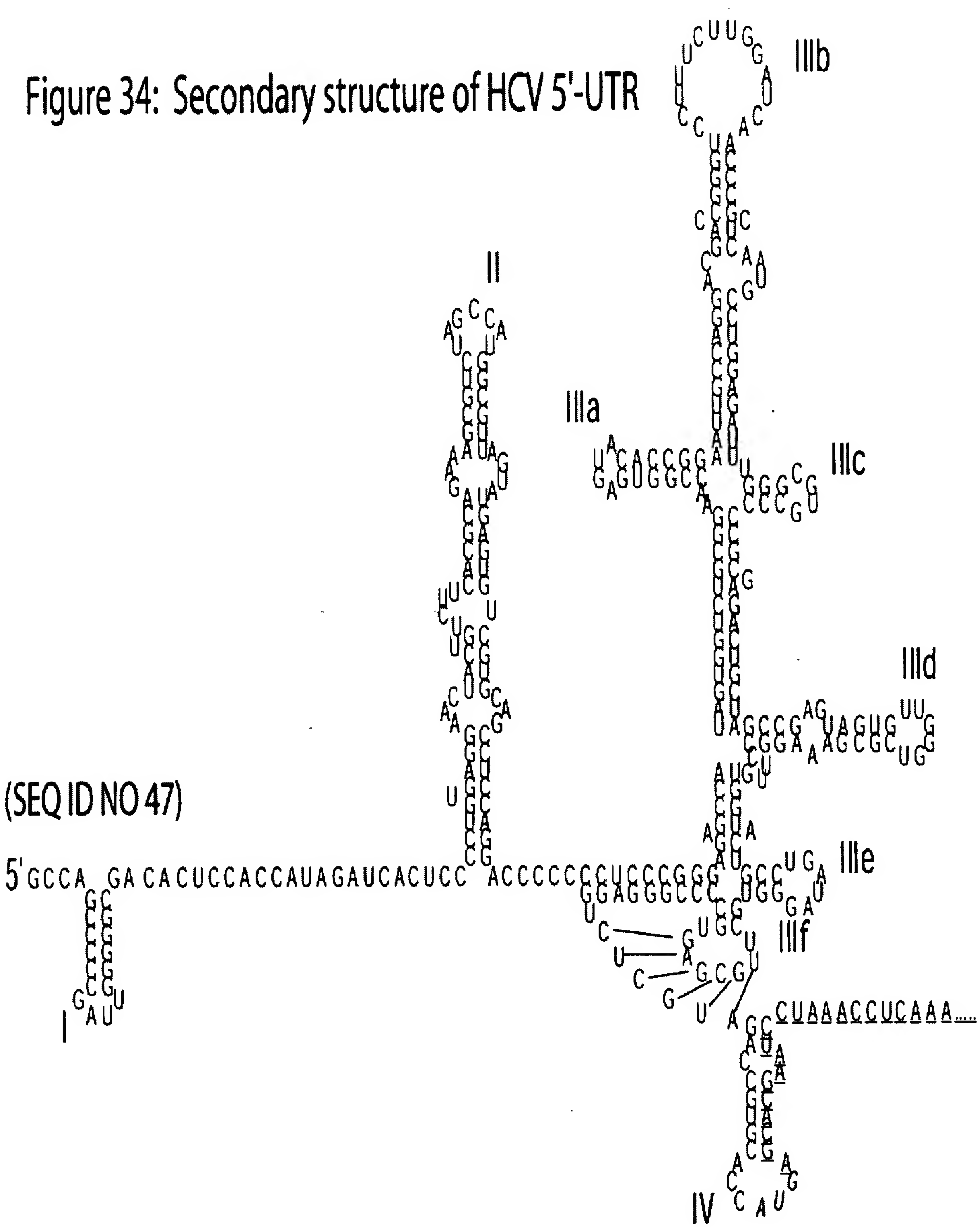
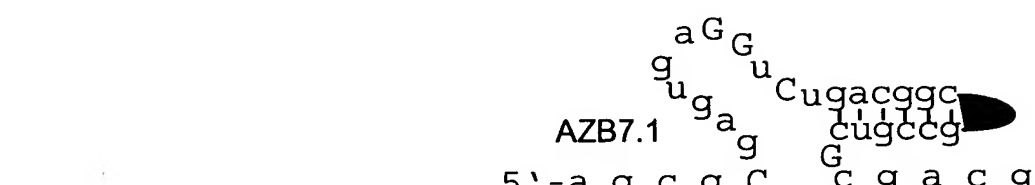


Figure 35
Design of SNP Detection using Halfzyme-AZB7.1



SEQ ID NO:

50
51
52
53
54
55
56
57
58

Figure 36: Single Nucleotide Polymorphism (SNP) Detection

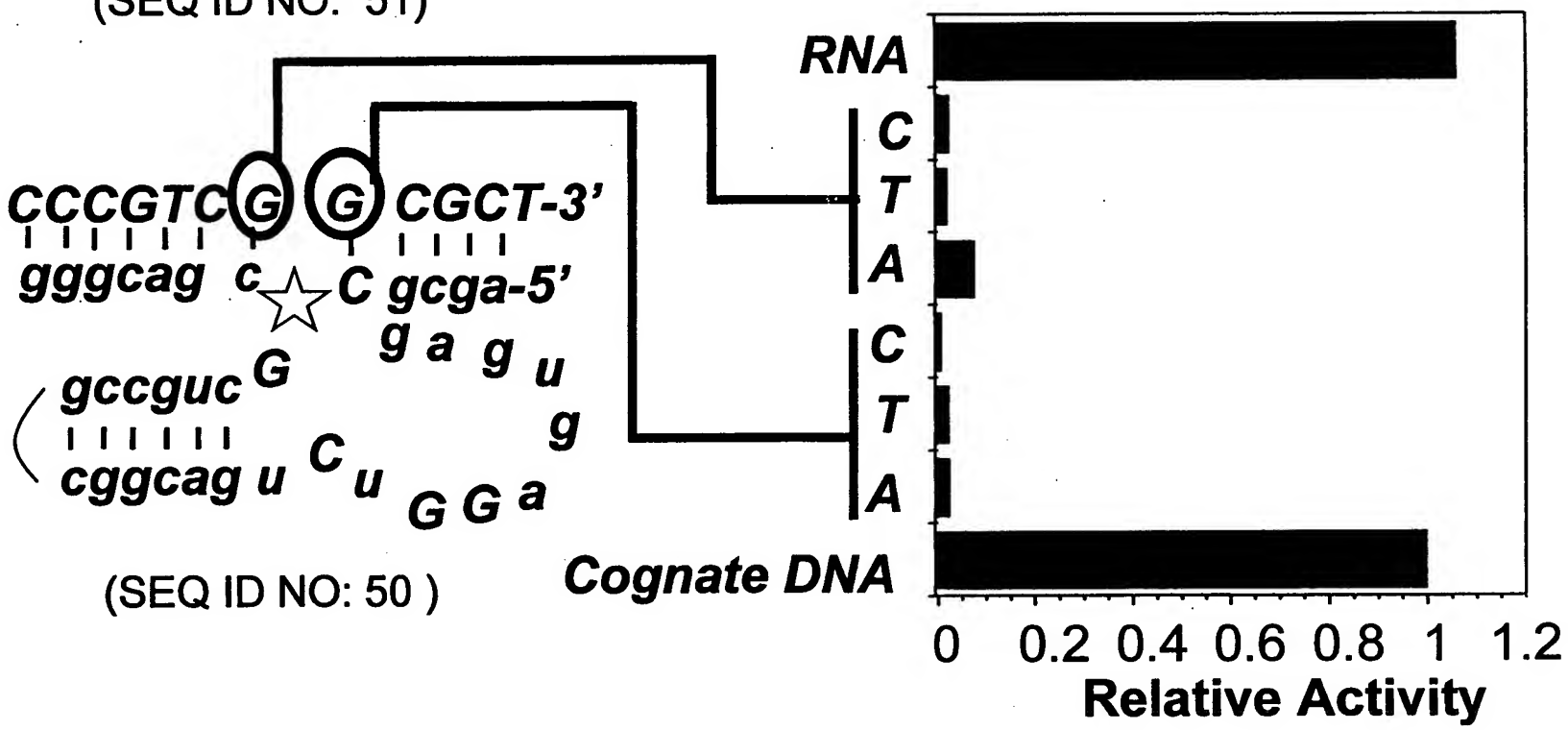
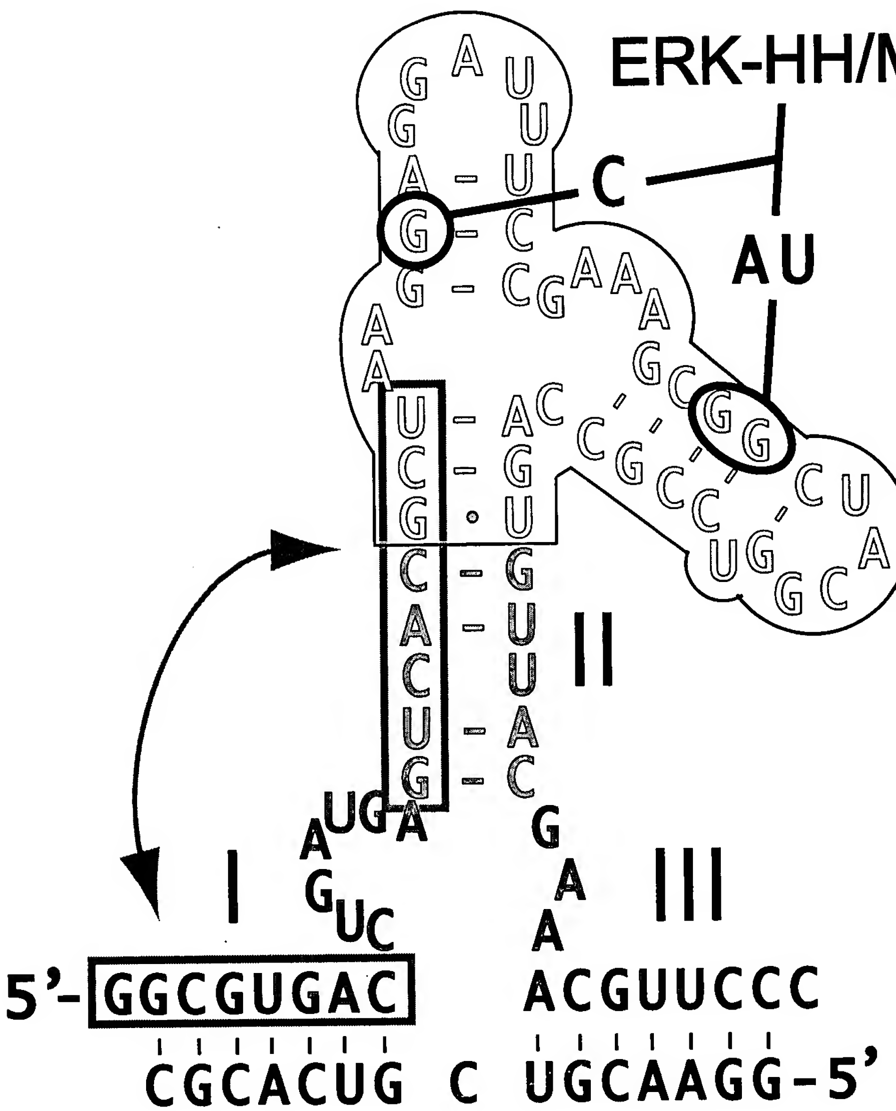


Figure 37A



(SEQ ID NO: 61)

(SEQ ID NO: 62)

Figure 37B

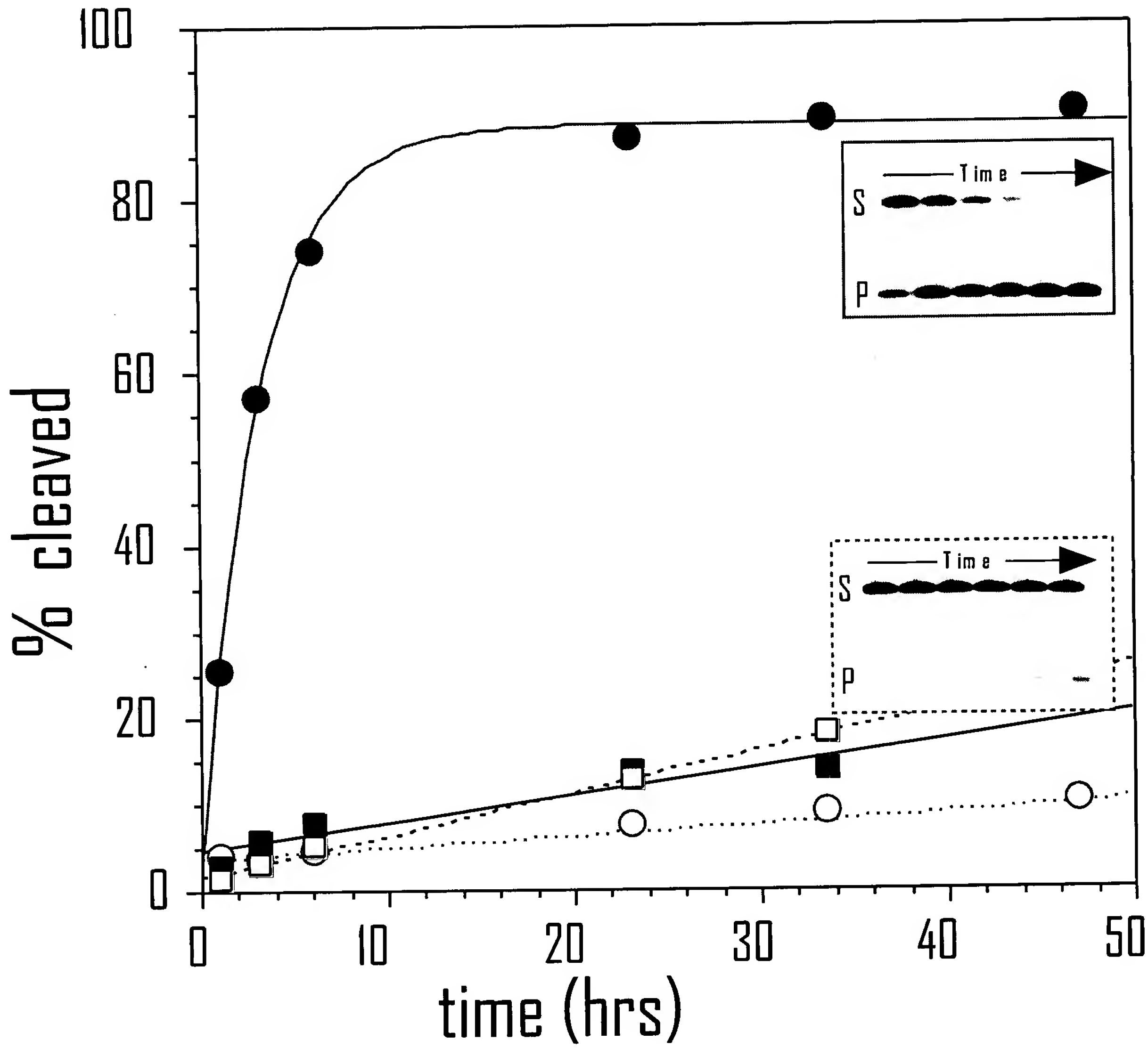


Figure 37C

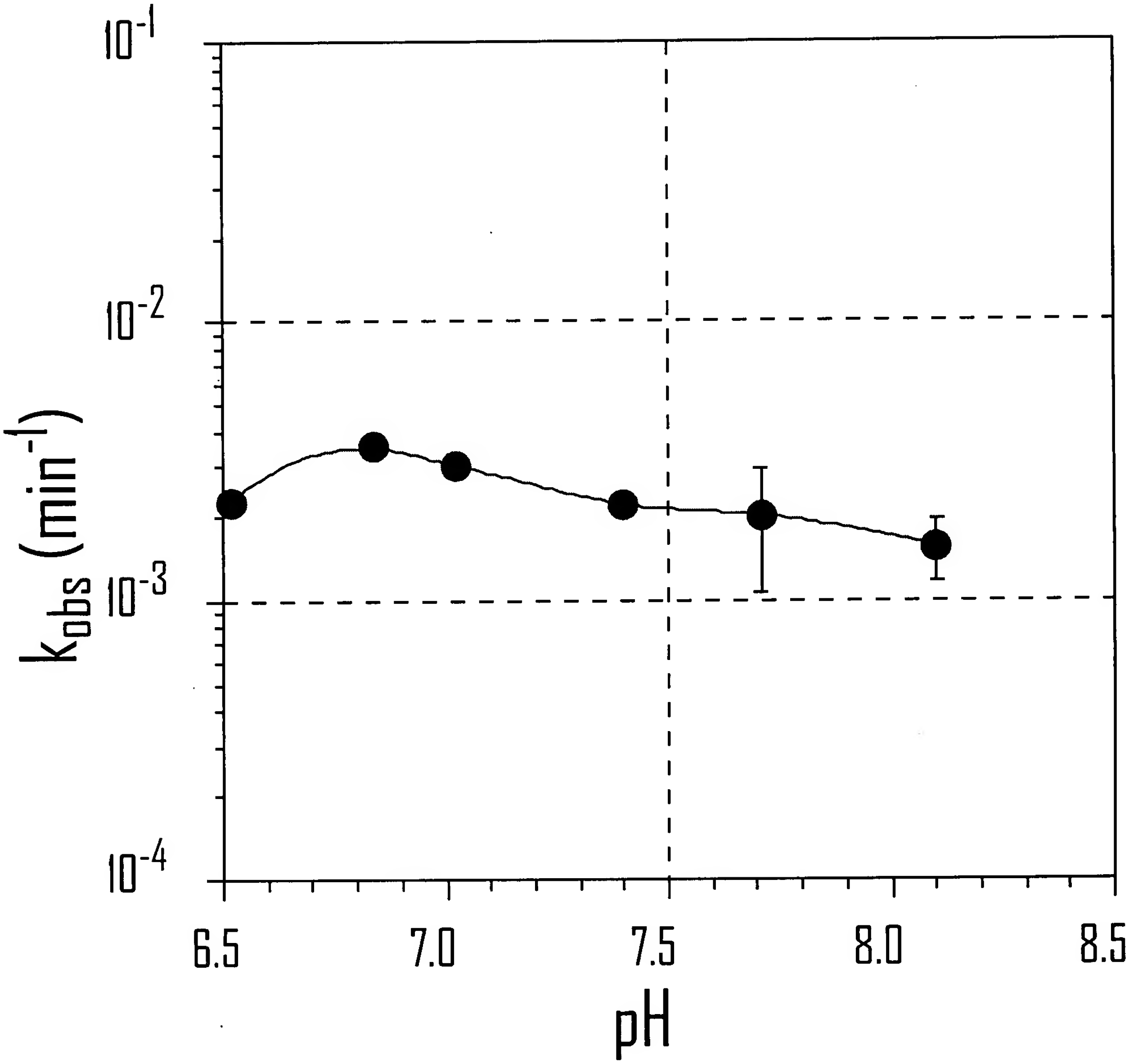


Figure 37D

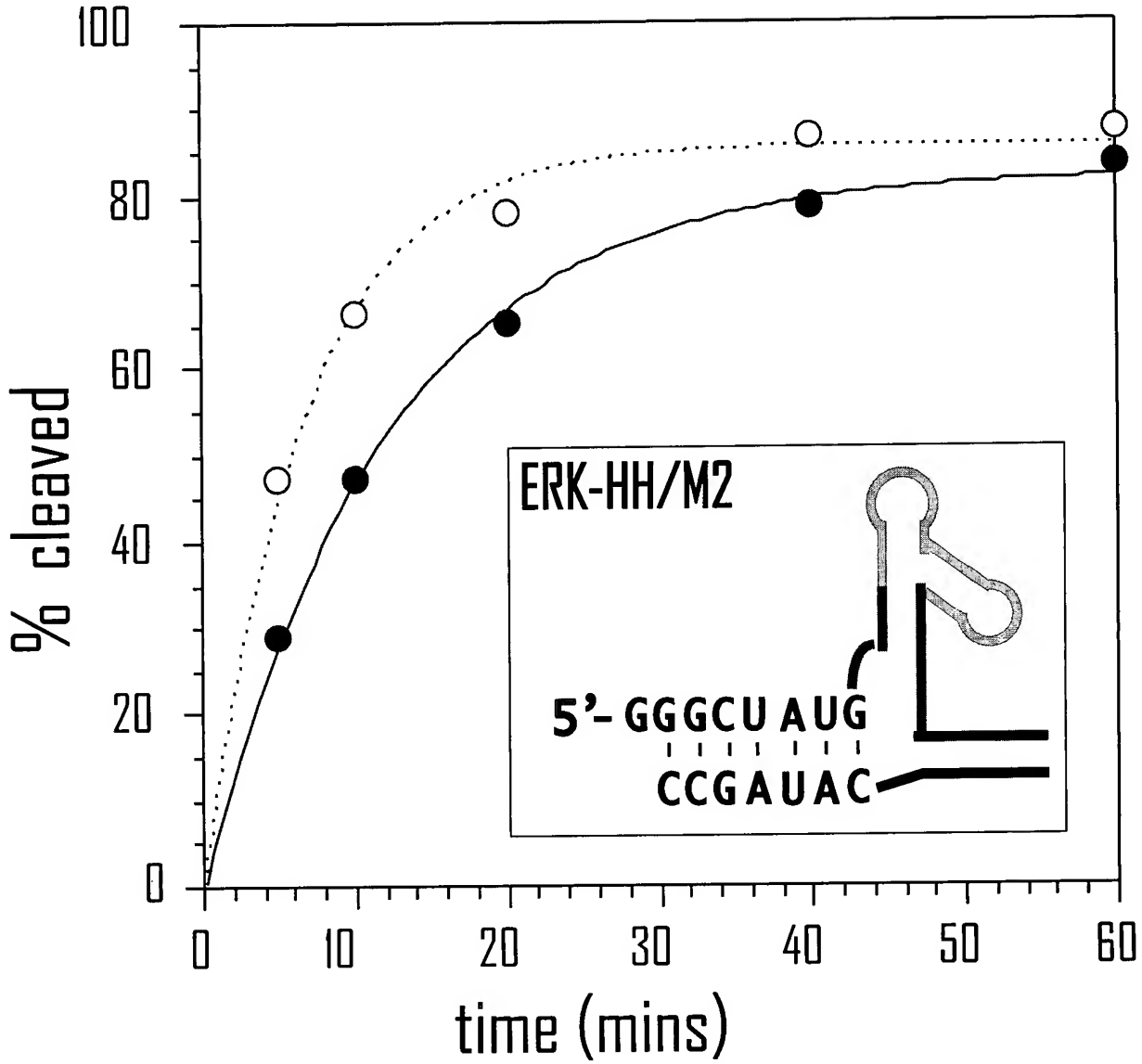


Figure 38

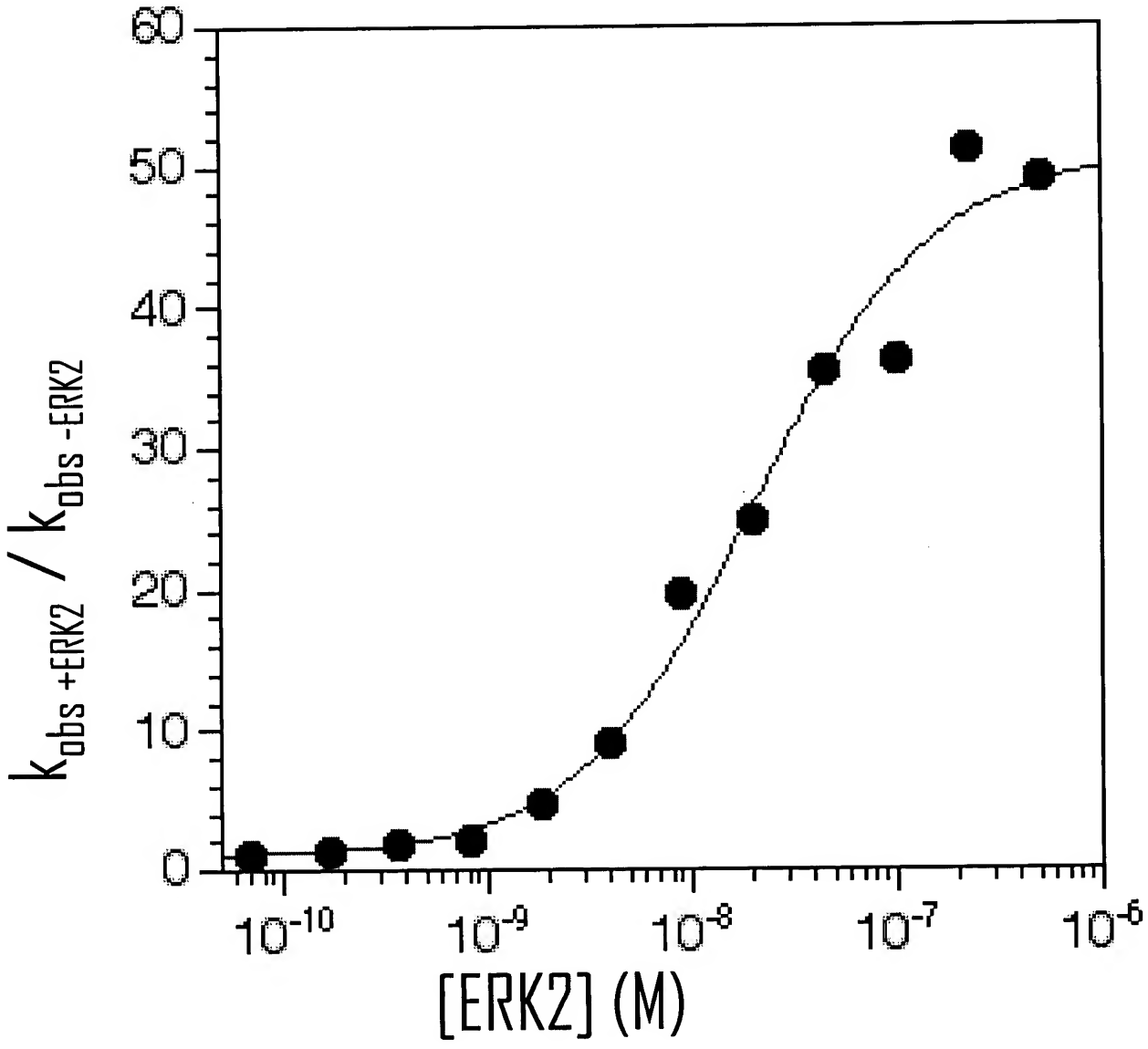

60
50
40
30
20
10
0
$k_{obs\ +ERK2}$ / $k_{obs\ -ERK2}$
10^{-10}
10^{-9}
10^{-8}
10^{-7}
10^{-6}
[ERK2] (M)

Figure 39A

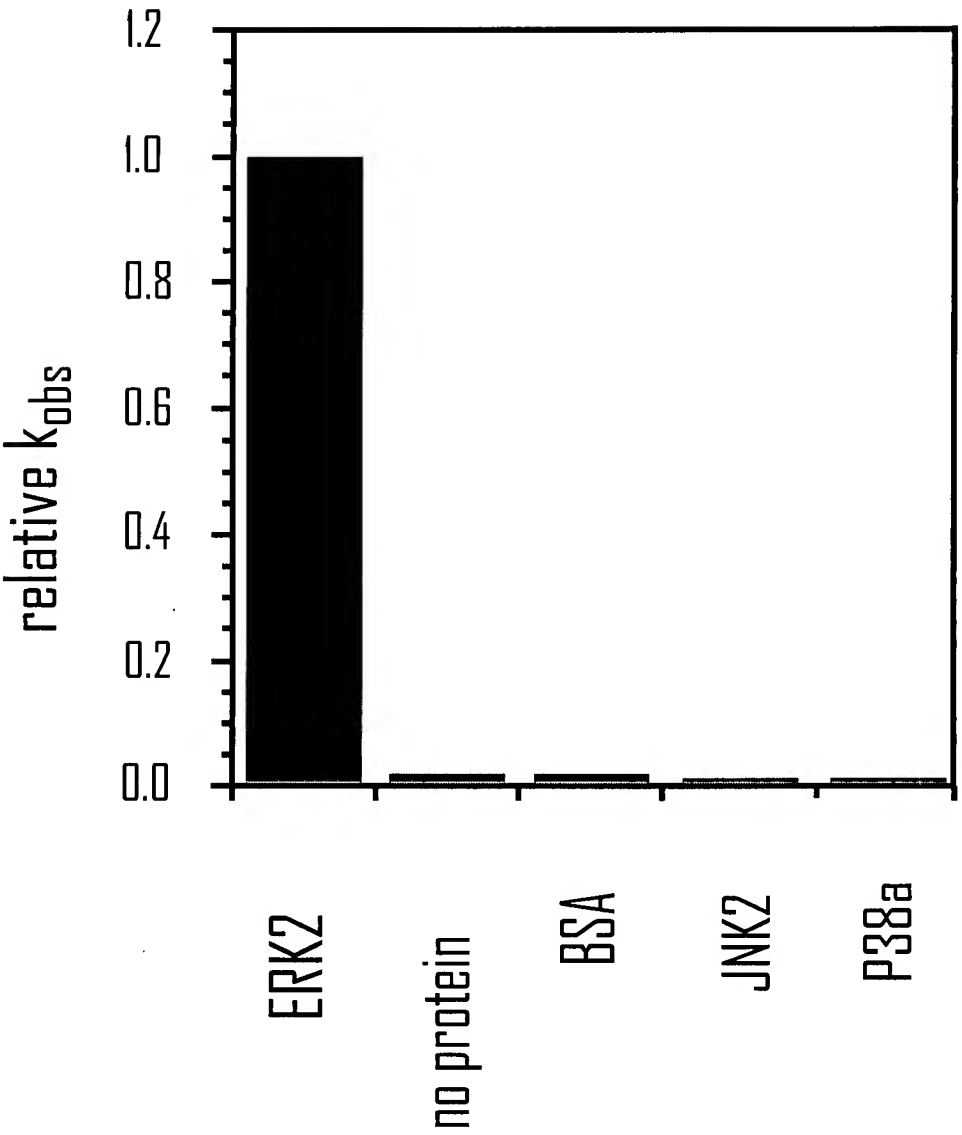


Figure 39B

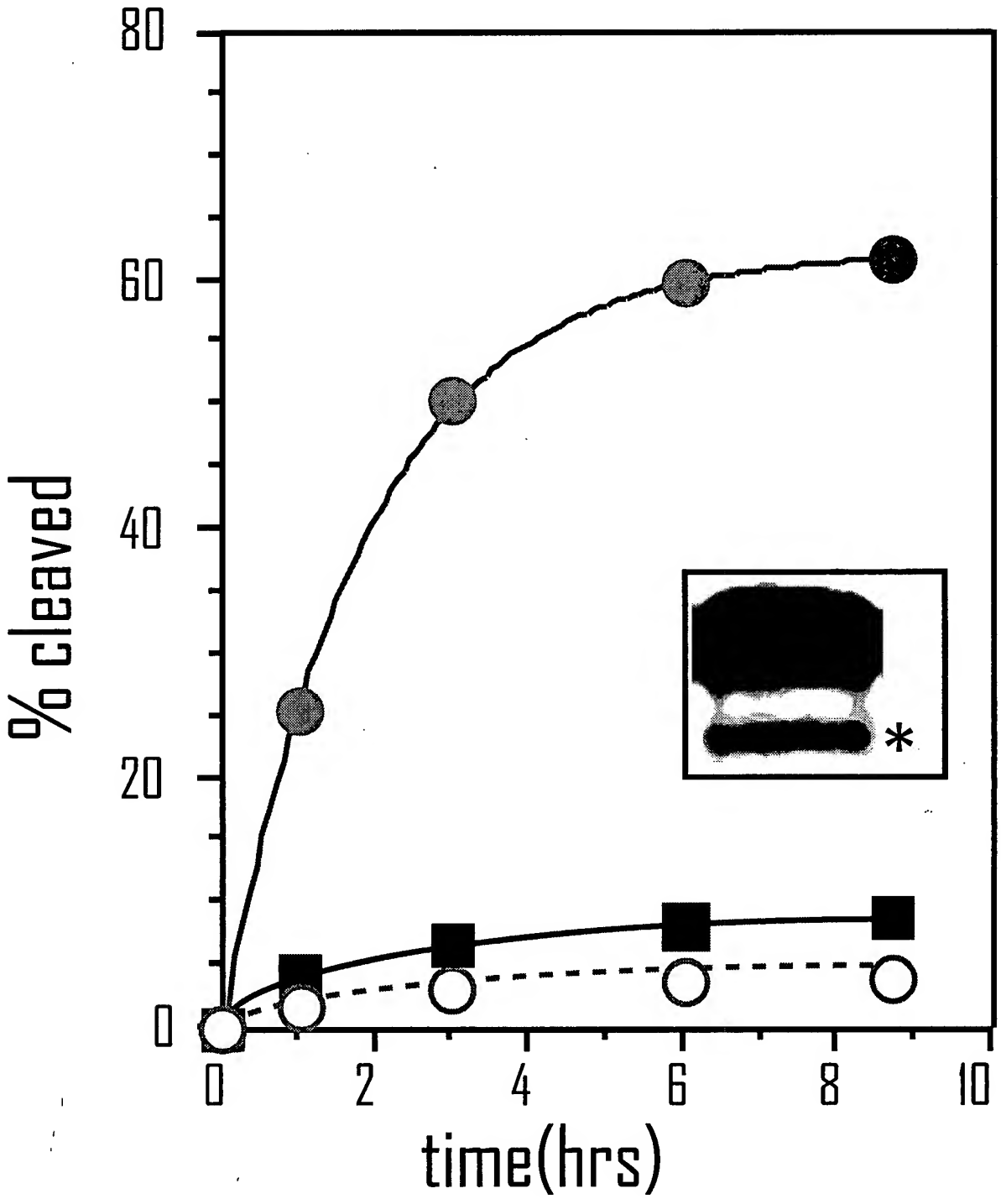


Figure 40A

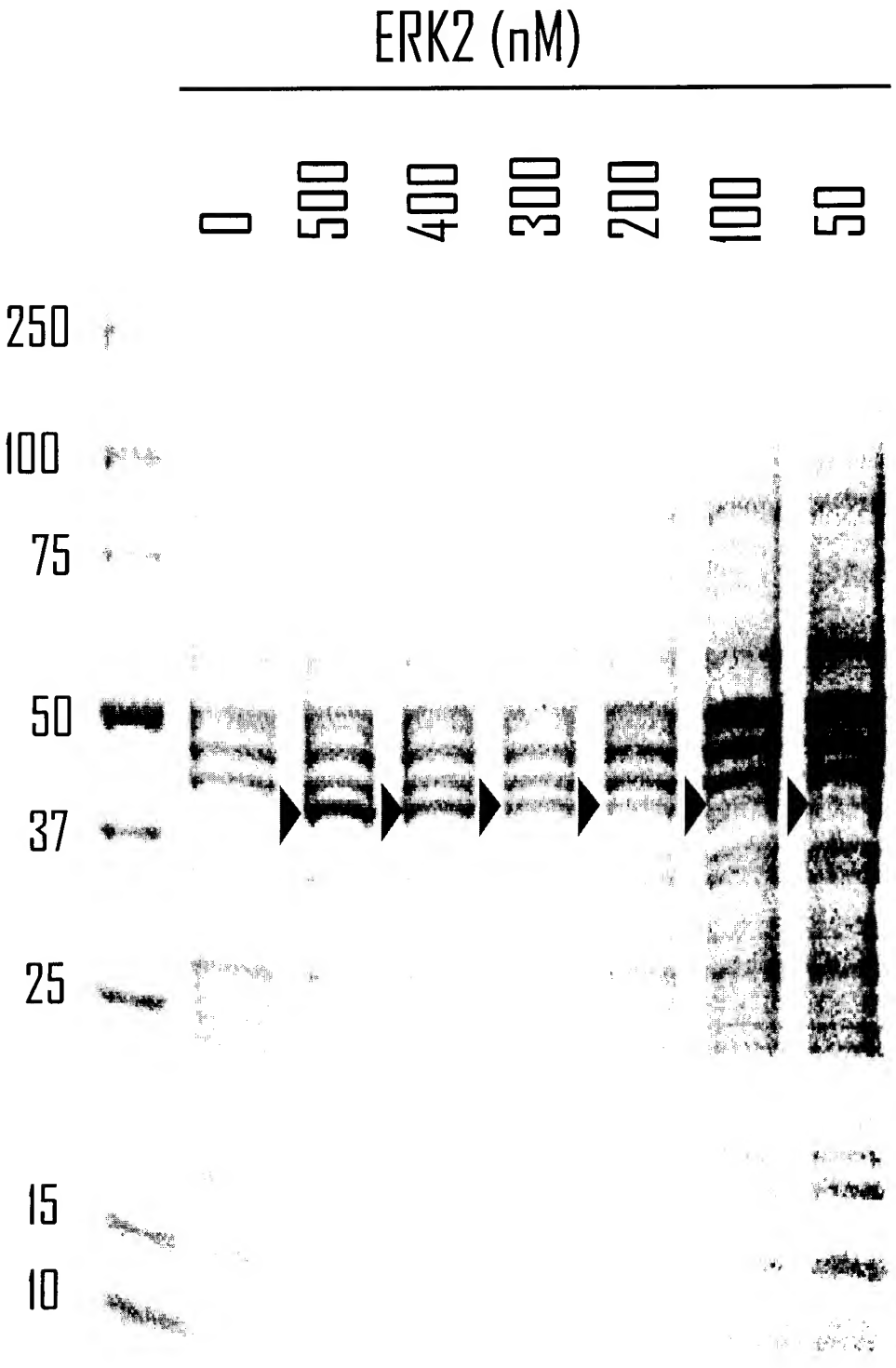


Figure 40B

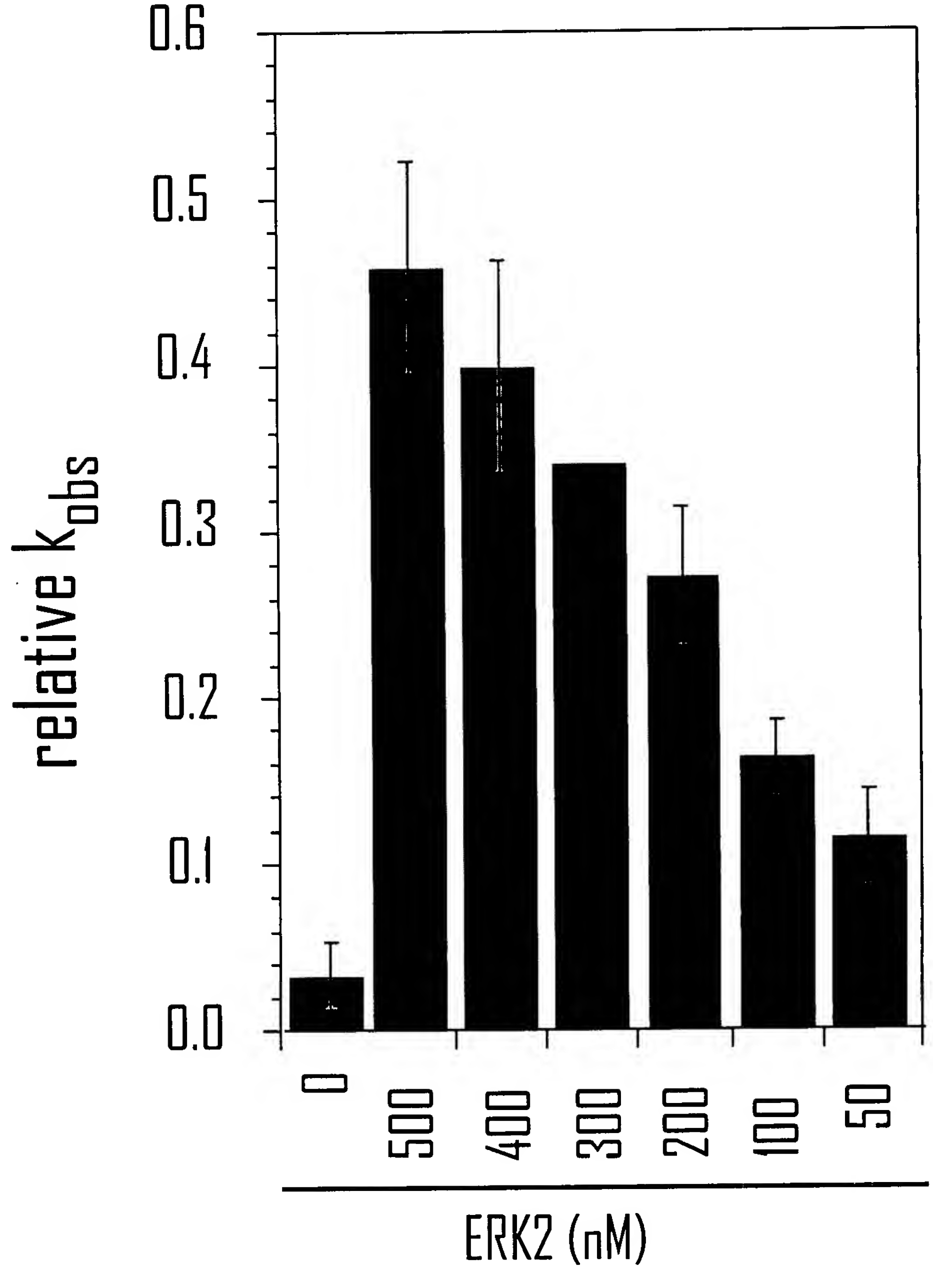


Figure 41A

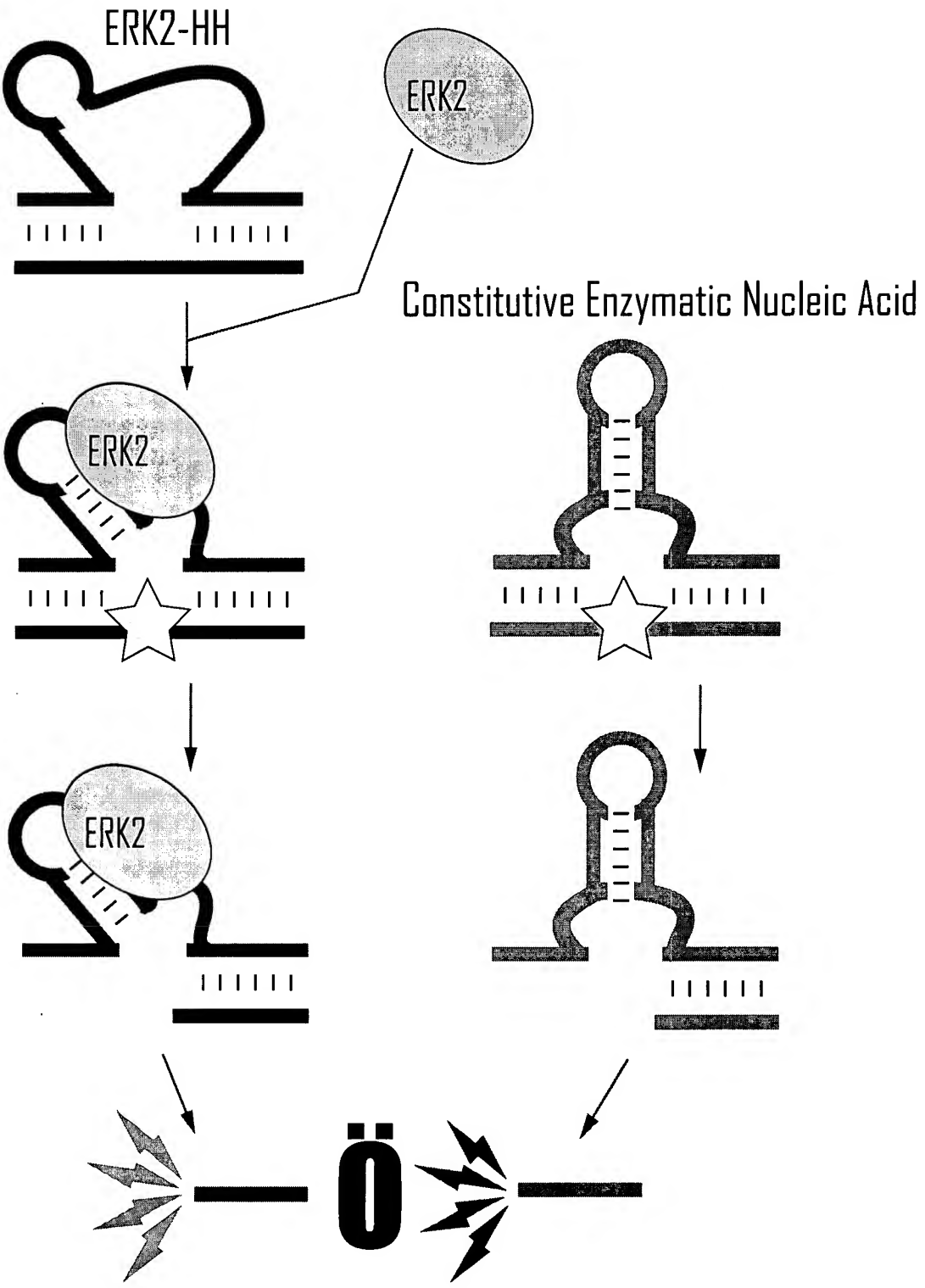


Figure 41B

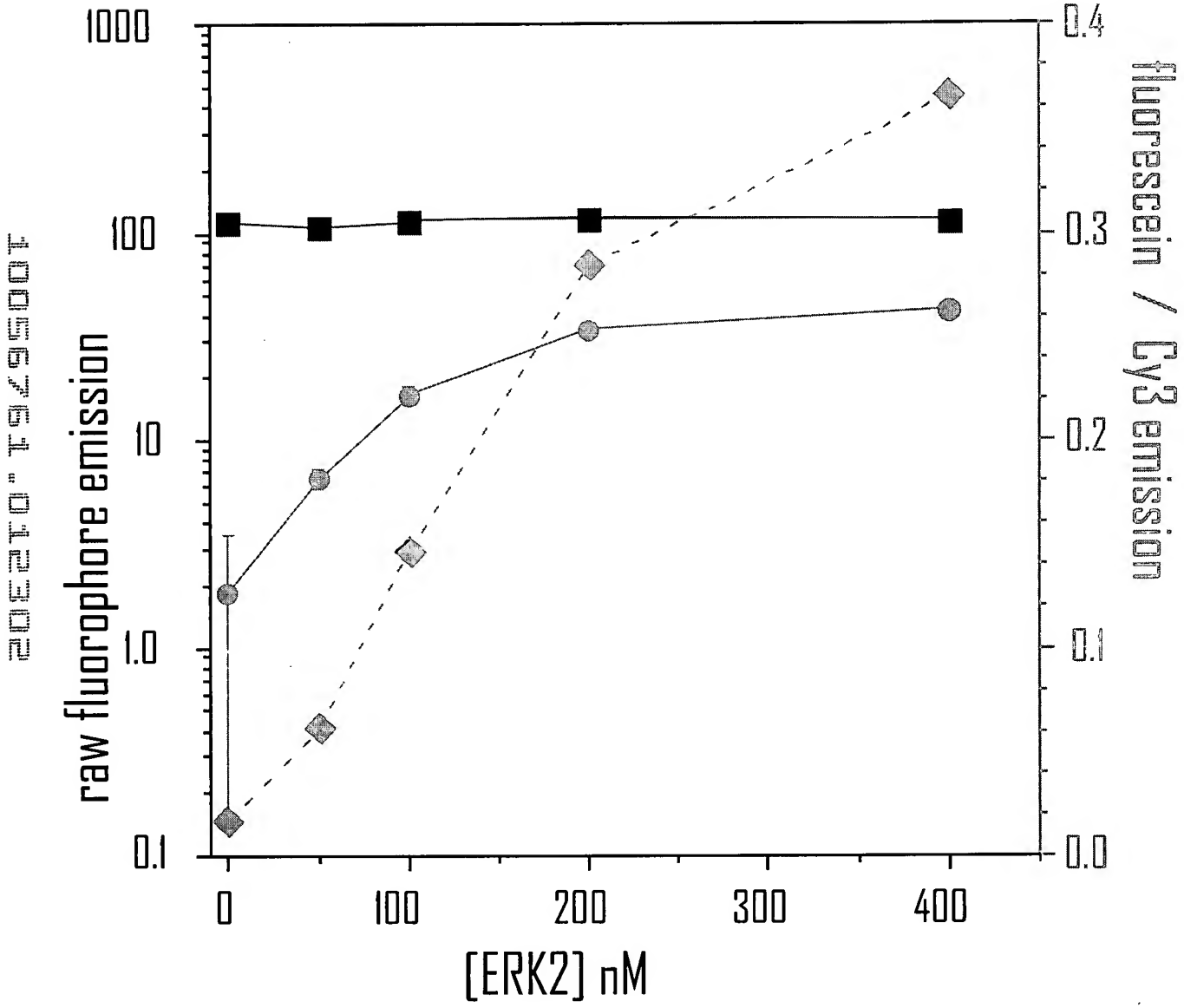
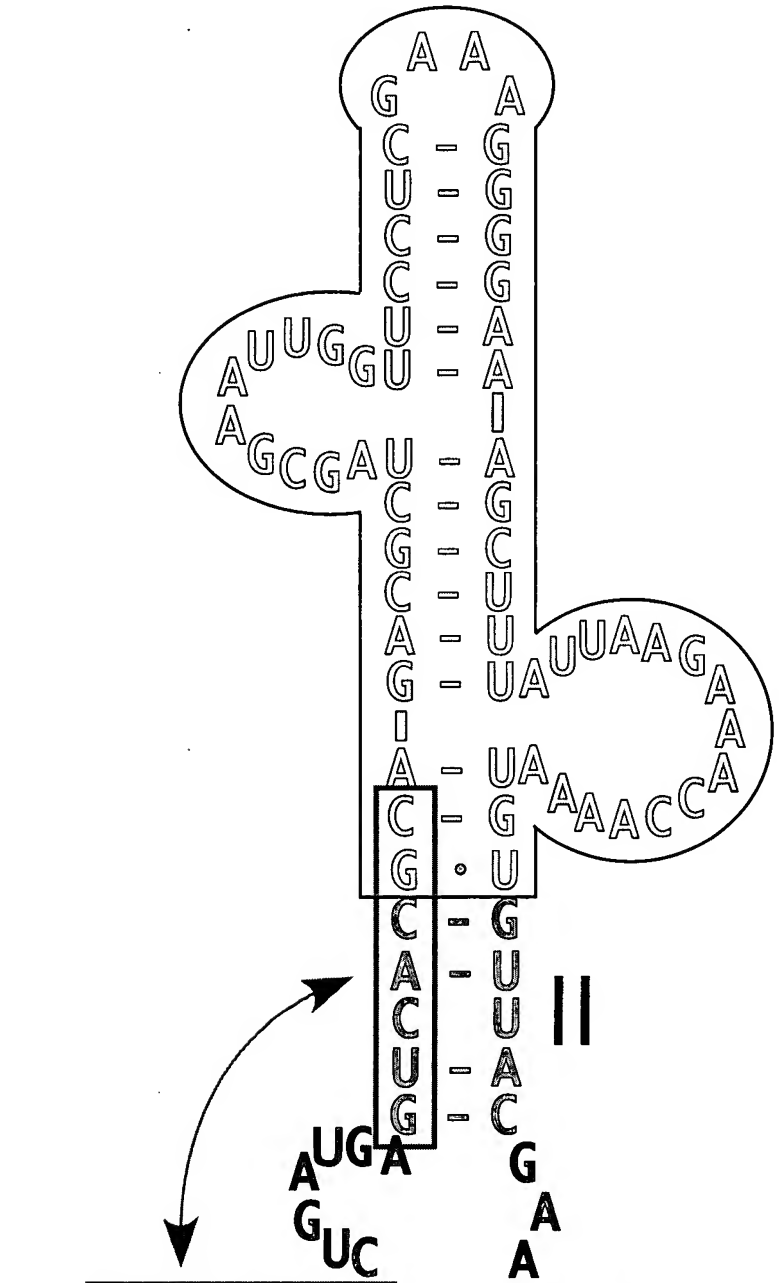

1000
100
10
1.0
0.1
raw fluorophore emission
0.4
0.3
0.2
0.1
0.0
fluorescein / Cy3 emission
0
100
200
300
400
[ERK2] nM

Figure 42A



5'-GGCGUGAC ACGUUCCC (SEQ ID NO: 63)
CGCACUG C UGCAAGG-5' (SEQ ID NO: 62)

Figure 42B